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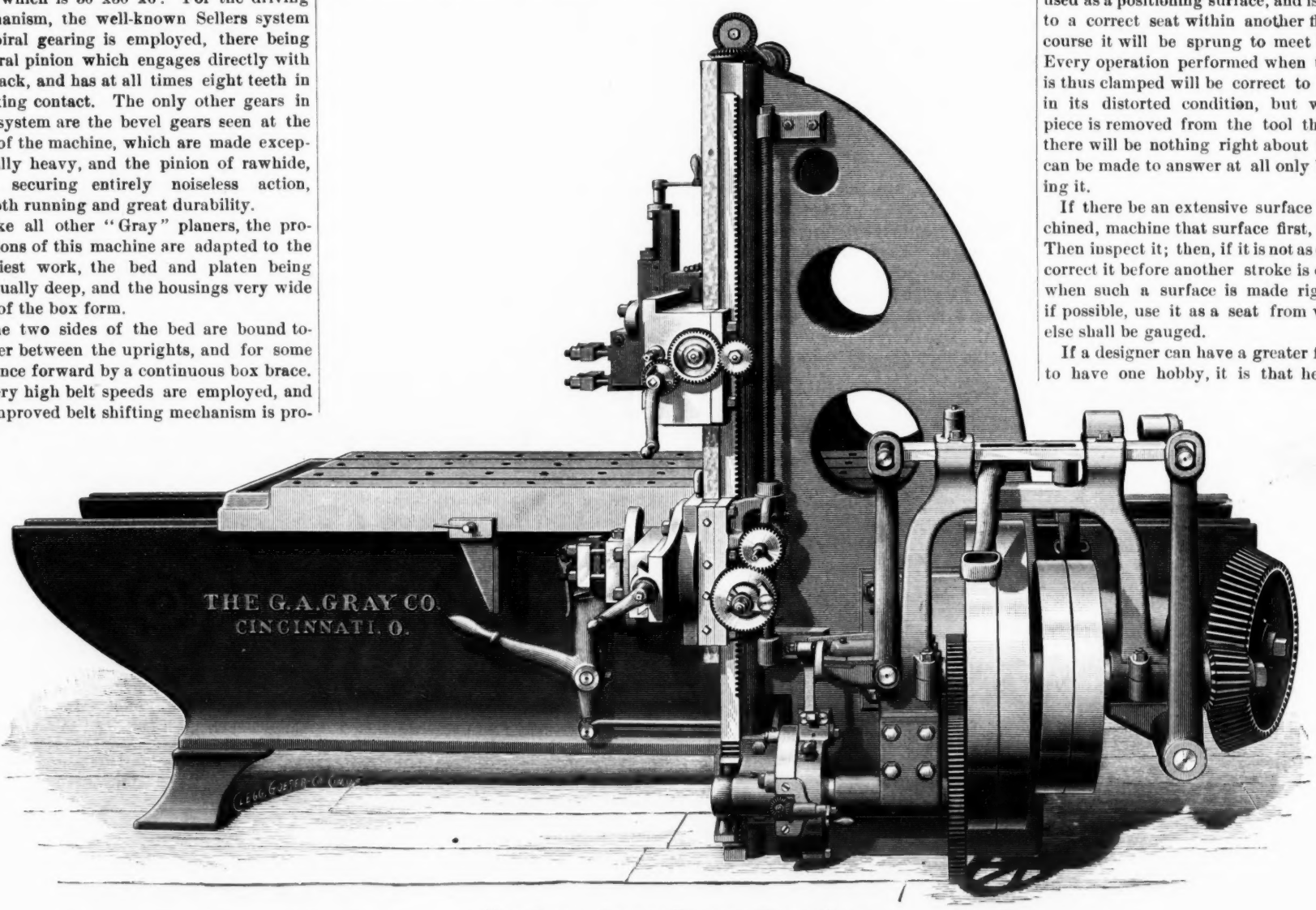
A New Spiral Geared Planer.

We present on this page and on page 2 front and rear views of a new line of planers which has recently been brought out by the G. A. Gray Co., of Cincinnati, Ohio. Our illustration is of the smallest machine of this line, which is 30″x30″x6′. For the driving mechanism, the well-known Sellers system of spiral gearing is employed, there being a spiral pinion which engages directly with the rack, and has at all times eight teeth in working contact. The only other gears in the system are the bevel gears seen at the rear of the machine, which are made exceptionally heavy, and the pinion of rawhide, thus securing entirely noiseless action, smooth running and great durability.

Like all other "Gray" planers, the proportions of this machine are adapted to the heaviest work, the bed and platen being unusually deep, and the housings very wide and of the box form.

The two sides of the bed are bound together between the uprights, and for some distance forward by a continuous box brace.

Very high belt speeds are employed, and an improved belt shifting mechanism is provided, which can be handled from either side of the machine. The side heads can be run down below the platen, as seen, can be used to plane at any angle, and have automatic feed up or down, by nuts which engage with stationary screws. All feeds may be thrown in or out simultaneously or independently, as may be desired, and may be reversed independently. They have a range on this size machine from the finest feed to ½″. Some idea of the solidity and capacity of the machine may be had from the fact that it weighs about 12,000 lbs.



NEW SPIRAL GEARED PLANER.—FRONT VIEW.

A press dispatch from St. Paul undertakes to enlighten us as to some proposed introduction of electricity in a new flour-mill there. It does this in the usual manner, by saying in one place that electricity is to be used instead of steam or water-power, and in another place that "the water at the Falls of St. Anthony will be used only for the generation of the fluid lightning." This, of course, would be a very unimportant service for the water to perform. Electricity would be doing all the work.

Equalizing Work Within Fixtures.

BY A. D. PENTZ.

It too frequently is the cause of great chagrin to the designer of an elaborate outfit of special tools, and of a feeling of disgust on the part of sensible and just men who have paid for them, that the work done on these tools won't assemble as calculated.

An examination may show that the models will all fit the tools perfectly, so that it is not the tool makers who are to be blamed. The parts made in the tools, when they are clamped to the places where they were made, seem to be correct, so the operative is not at fault.

Where then is the trouble? The model is correct. It goes together, and runs without a stick or shake, and it does what it is designed to do. The output from the tools, on the contrary, has to be filed here, sprung there, reamed to line for the main driving shaft, re-faced for a shoulder on a stud, new shafts turned for the enlarged holes, and all the wheels and other parts have to be re-made to fit them. To do all this, an army of fitters and hand workmen, which were not anticipated in the estimates, have to be got, new tools must be provided for its use, room to work in must be found, and money to pay with must be forthcoming.

It is not to be marveled at that the designer of the tools is blue, and explains incoherently. Neither is it wonderful that the unpractical but necessary man at the check-book should fume and tear language-"There are the facts of actual costs, here are your expected costs —— ? —— ! —— ! —— ! —— ? —— ! —— ! ! !" Surely the humble and unpretentious tool maker need not in that day envy the elaborate technical graduate.

It, of course, is impossible to say what always is the whole fault, but it is easy to show what always is a great part of the fault in such a state of affairs as is indicated above, and that is: There either has not been a sufficient understanding of the elasticity of the metal being machined, allowance made for it, precautions taken to prevent deflection in the setting of it, and by the stress of the cuts, or that the operations done in an early stage of the manufacture of a piece are permanently and injuriously disturbed by those that come later.

If a piece should have holes of great importance drilled and reamed in it as a first operation, and afterward should be milled over a considerable surface, thus removing the scale and a depth of metal from such surface, it is more than probable that the holes made before such planing will be so much disturbed as to be worthless. Or, if the milling be a first operation, and while the piece still remains within its clamps, it shows a true surface, but after it is removed it is in wind; then, either the piece has been badly set, or in an insecure fixture, or it has yielded to internal strains, which have lost the metal that resisted them. If, then, it be taken for a fact, without inspection, that this planed surface is true, and it is used as a positioning surface, and is clamped to a correct seat within another fixture, of course it will be sprung to meet that seat. Every operation performed when the piece is thus clamped will be correct to the piece in its distorted condition, but when the piece is removed from the tool that held it there will be nothing right about it, and it can be made to answer at all only by botching it.

If there be an extensive surface to be machined, machine that surface first, as a rule. Then inspect it; then, if it is not as designed, correct it before another stroke is done, and when such a surface is made right, then, if possible, use it as a seat from which all else shall be gauged.

If a designer can have a greater fault than to have one hobby, it is that he has arbitrary rules, which is the same thing as having a hobby for everything. One of the first rules learned is that a thing which lies on three points rests firmly, and there is no other rule relating to the seating of one object on another that seems to have so few exceptions as that one has. When a designer without practice, but who is a master of the rules, is considering a piece of mechanism in relation to tools, and finds that it should either be drilled or milled flat on one side, as the initial operation, then the three-point rule at once reports for duty as means to support it in the drill jig or the milling fixture.

Now, it may be that three points make the best foundation for a particular piece, and it may be that more are needed, or even that two are better. No rule can be made or applied, either as to the number of these points, their shapes or location. As a general thing, rough pieces should be upheld on rounded surfaces, while machined surfaces should have larger seats shaped to cover a considerable surface. All that can be generally said is that the supports must

be distributed under the cut, so that they prevent the tool from springing the piece in operation, and that each one of the supports has an equal touch or bearing.

To support a piece on three points is a very simple problem, but in jigs and milling fixtures three points are seldom the better number. A rectangular piece, which is adaptable to a vise by being small, thick enough, and having edges suitable to be gripped, is the simplest of pieces to be milled, and seldom requires other support than that which the jaws of the vise afford, although seats to support the piece until the jaws are set up to grip it are required in the simplest of these fixtures. The adjusting of four points under a rough and crooked shape, and where no two are alike, is also a problem of a simple character mechanically, if the *operator* be left from the calculations, and may be made as the fixture indicated in Figs. 1, 2 and 3.

In this fixture there is nothing recommended, but there is shown a method of equalizing on four points which is theoretically better than it is practically. Of course the piece shown should have more than four supports, but that is not pertinent to the present discussion.

The fixture *A* may be made of a casting, and be planed all over its outer surfaces. The stationary jaws *E E* should be faced by steel, as indicated by the plates *M*, in Figs. 1 and 2. These plates may be attached to the jaws by pins through both. The stop *D* is bolted on, because it facilitates the making of the fixture, and it is not subjected to so great a strain in resisting the driving action of the cut as the jaws *E E* are in the clamping of the piece.

The adjustable jaws *F F* are of steel. They are levers, and have fulcrums that fit the groove *I*, in the fixture *A*, shown in all the views The bolts *H H*, which attach these adjustable jaws to the fixture, may with propriety be extended through to the other side of the fixture. These jaws *F F*, when they are set up by the nuts *G G*, secure the plate *B*, which is to be operated upon. Some arrangement of this character is necessary where the milling cut extends to the edges of the piece, as is here indicated by the two surfaces *C C*. Clamps covering the top of the piece would be impossible, because they must occupy a part of the surfaces to be cut in the operation in question, and end clamps, whether they cover the top of the piece or grip the edges, are not considered to be so good for a plate of this kind, because the friction of the grip, as here shown, helps to prevent the plate *B* from being deflected by the stress of the cut.

The plate *B* is a bed for a machine, and is to have two side pieces bolted to the seats *C C*. The space in the middle section is left rough. These seats are narrow, and are the only parts to be milled in this operation. They should both be on the same plane, because the sides which are to be bolted on depend on them for the location of parts.

Under each corner of this piece *B*, and at some distance from each end of the fixture, is a support. The locations of these are shown in Fig. 3, where they are marked *O P R* and *N*. Two of these, *P* and *R*, are rigidly secured to the fixture, and are of the same height. The other two, *N* and *O*, fit freely within parallel holes in the fixture, and they rest on the adjusting wedge *J*, the endwise adjustment of which regulates their height. The support *O* is as much longer than the support *N* as the wedge *J* tapers between their respective locations in the fixture. Now the fixture *A*, it is presumed, will be fastened to the platen on a milling machine, and the wedge *J* will then, of course, rest on that platen as well. Hence, the top ends of both *N* and *O* will, when they rest on this wedge, have each the same height from the base of the fixture. This wedge is arranged in a slot higher than its width, as indicated at *T* in Fig. 2, so that it may be moved along from one position to another. At one position of the wedge, the four supports *O P R* and *N* will have an equal height from the base of the fixture, and from that height the two, *N* and *O*, may either be raised or depressed by the adjustment of the wedge *J*.

The rigid supports *P* and *R* are under corners of the piece *B*, diagonally opposite each other, so that, when this piece is upheld on these two supports alone, they will give it an equal height at two spots far apart.

It is intended, when the piece *B* is first laid in the fixture, that the wedge *J* will be drawn back so that neither of the adjustable supports shall touch, and that the piece *B* will be moved by hand to a position where it firmly sets against the jaws *E E*, and the stop *D*. While it is securely held in this position, the wedge is carefully pushed inward until both the adjustable supports bear equally, and take as much of the weight of the piece *B* as the rigid supports do. When the wedge is thus properly adjusted, it must be fastened by the screw *S*, to prevent it sliding endwise. This screw *S* acts on a plug gib having a suitable angle to meet the wedge squarely.

Now, having the piece *B* resting equally on four points as proposed, the nuts *G G* should be tightened. After clamping, the piece must be tapped down as usual, to be sure it lies on the supports, and has not been lifted. It may then be milled.

I can say that varieties of this method of equalizing are in use, and I wish I could say that they give

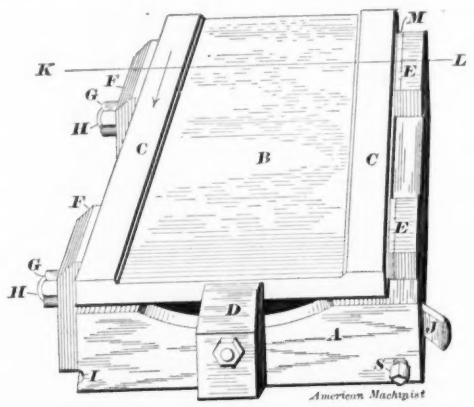


Fig. 1.

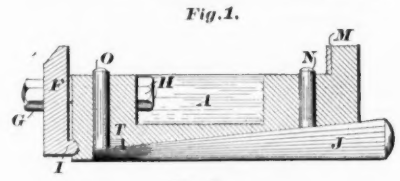


Fig. 2.

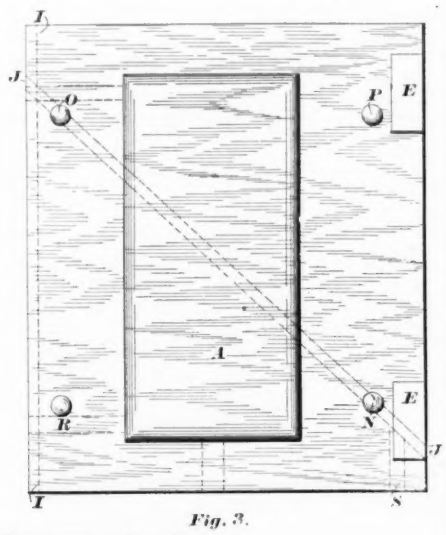


Fig. 3.

EQUALIZING WORK WITHIN FIXTURES.—SEE PAGE 1.

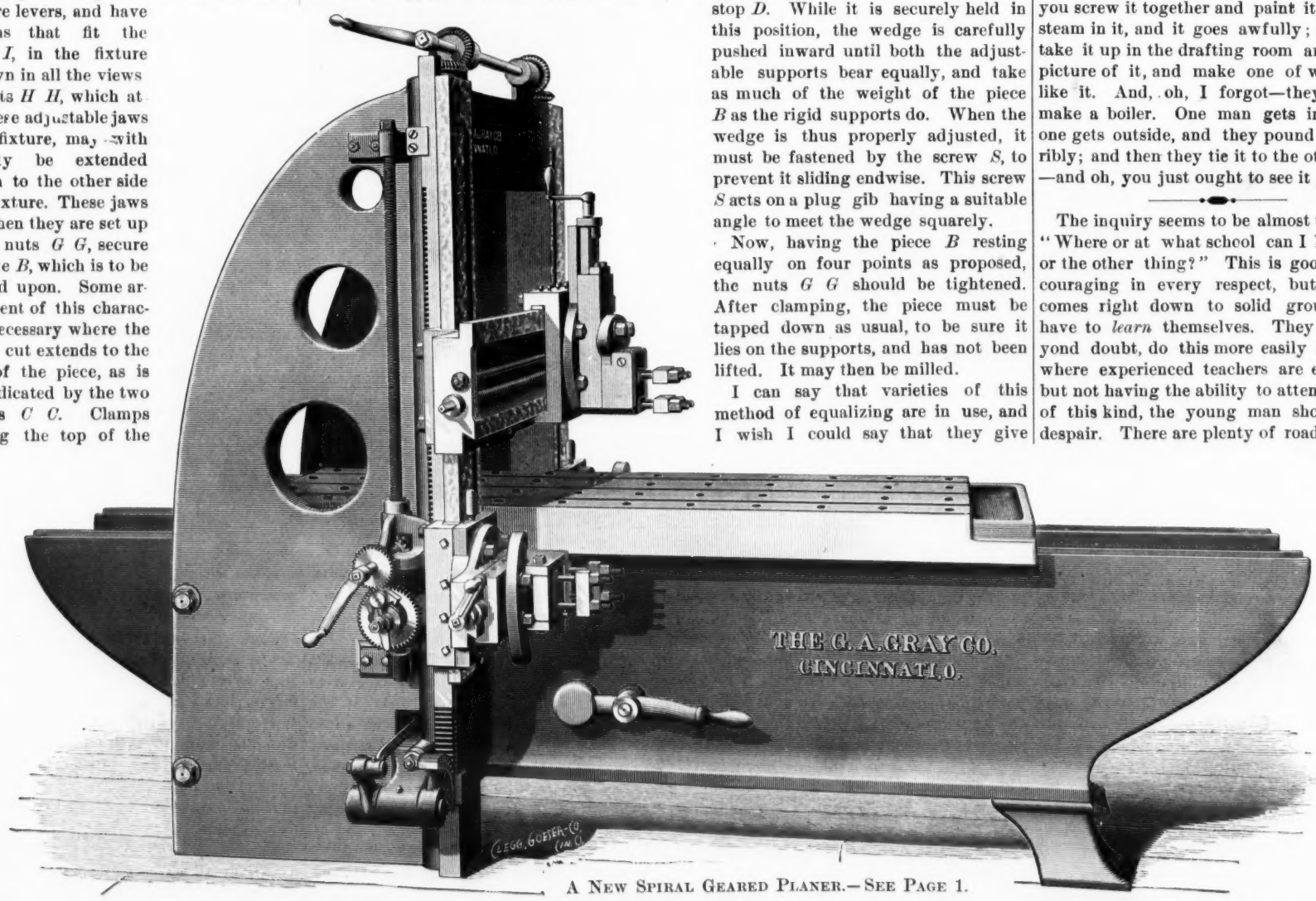
Returning to the opening remarks, it but remains to be said, if the bed *B* shown in the cut is not milled to a plane, then the two sides that are to be bolted to it will not be properly positioned the one to the other, and this could give all the trouble mentioned in the commencement of this article. And there will be no serious dissent from the statement that more trouble comes from untrue work than from irregular sizes or positions, and that work is more often untrue from insecure support and unreliable fixtures than from all other causes combined.

In another article I will submit an equalizing device which may be considered to be better than this one, which has been set forth principally to indicate its defects, because it is an attractive device in theory, but in practice it is a pitfall and a snare. I have been careful also to show it in better shape than it is usually constructed. The piece *B* is hypothetical.

Engine Building as Described by a Young Lady.

We find in *Power* the following from a young lady's description of how a steam engine is made, according to her study of the subject during a visit to the Payne Engine Works, at Elmira, N. Y. "You pour a lot of sand into a box, and throw a lot of old stoves and things into a fire, and empty the molten stream into a hole in the sand, and the men all yell, and it's awfully dirty and smoky. And then you pour it out and let it cool and pound it; and then you put it in a thing that goes round, and try to break it; then you screw it to a thing that goes back and forth, that you can ride on, and that scrapes it and it squeaks; then you put it in a thing that turns it round, and you take a chisel and cut it; then you put it in a thing that bores holes in it. Then you screw it together and paint it, and put steam in it, and it goes awfully; and they take it up in the drafting room and draw a picture of it, and make one of wood just like it. And, oh, I forgot—they have to make a boiler. One man gets inside and one gets outside, and they pound just terribly; and then they tie it to the other thing—and oh, you just ought to see it go!"

The inquiry seems to be almost universal, "Where or at what school can I learn this or the other thing?" This is good and encouraging in every respect, but when it comes right down to solid ground, men have to *learn* themselves. They may, beyond doubt, do this more easily in schools where experienced teachers are employed, but not having the ability to attend schools of this kind, the young man should never despair. There are plenty of roads open to him, through which, by a little hard work, the would-be engineer will get there. And anything that is worth having is worth working for.



A NEW SPIRAL GEARED PLANER.—SEE PAGE 1.

The government of Bolivia has made important grants for the construction of a railroad from Oruro to the head of navigation on the Amazon River. This is believed to be in the interest of European commerce.

A New Riehle Testing Machine.

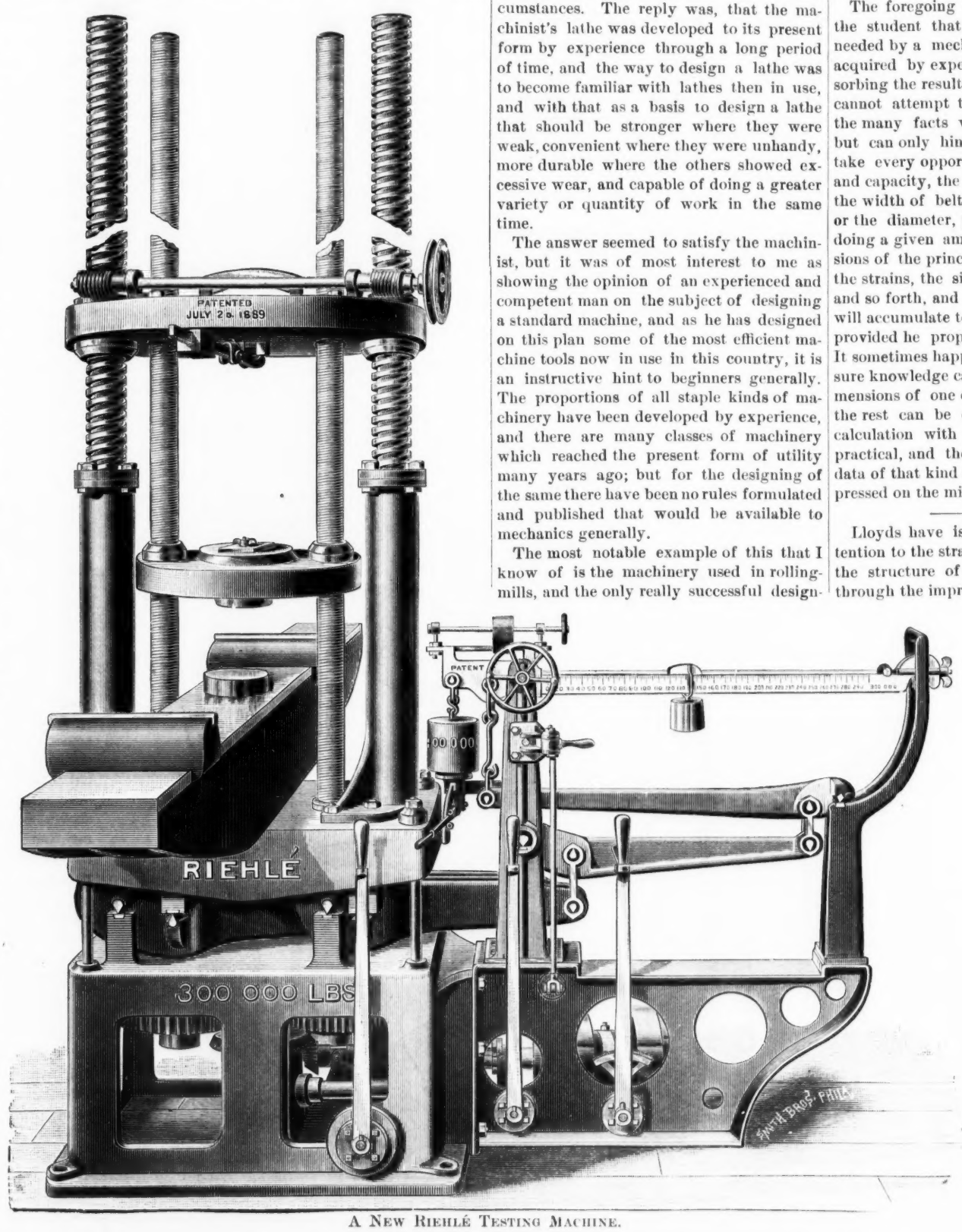
The accompanying illustration represents a new type of standard testing machine of 300,000 pounds capacity, built by the Riehlé Testing Machine Company, Philadelphia. The design allows of a wide range of movement and character in testing, with simplicity of parts.

The chief new feature in this machine is the double adjustable power crosshead, by which the testing heads can be set at any convenient height, or distance apart, to suit the nature of the test or pleasure of the operator. In order to accomplish this, the outside columns, which have usually been of any suitable shape and proportions, have been constructed as vertical stationary screws of coarse pitch, and the large bronze nuts in the upper head travel up and down by means of a worm wheel cut on their peripheries, the worms which drive them being in turn driven by the sheave pulley and a reversing countershaft somewhat like that of a portable drill. In the case of the lower crosshead, the screws revolve in the nuts, which are keyed fast, and hence the head travels up and down on the screws, as controlled by the reversing lever. These movements are independent of each other, and can be in the same or opposite directions.

A machine recently furnished to the Toronto School of Practical Science was capable of crushing specimens 10 feet in length up to the capacity of machine; of exerting tensile stress on specimens 10 feet long with 3 feet of elongation, and of applying transverse bending stress on beams 18 feet between supports. The arrangement of gearing and clutch levers is such that eight different rates of speed can be easily obtained by convenient levers. This feature is very valuable where a wide range of materials with varying ductility are tested, and also to obtain the quick speeds of adjustment and the very slow application of power in compression.

There is a new quick lever device for engaging and disengaging the friction gearing, which is convenient. Friction pulleys are also used for driving. The traveling vernier poise of the beam has the counterweight made to do double duty as a standard weight, and is lifted in much the same manner as on the emery machine. The gears are all cut, and the machine runs very smoothly and quietly. The crossheads are made of steel, and the best material is employed throughout.

The rapid growth in the demand for practical tests as opposed to theoretical computations is shown by the exact specifications, more particularly of the government and railroad companies, and the increasing demand for all kinds of testing machines, and the present tendency is strongly in the direction of testing full-sized specimens.



A NEW RIEHLÉ TESTING MACHINE.

Development of a Mechanic.

IV.

BY BELL CRANK.

It will be of great value to the young mechanic to learn early the extreme importance of grasping and making records of some of the numerous facts which have not yet been put into books so they are available for general use. The manner of keeping such a record is a matter of opinion and taste, to some extent, but the simplest and best plan I know of is the one described in the AMERICAN MACHINIST, as used by Mr. William Barr, which consists of a number of good sized strong manila paper envelopes, each being marked on the outside by a title indicating the subject matter of its contents, and all being arranged alphabetically in a case or letter file so they can be readily found. The most useful feature of this plan is its flexibility, for it can be enlarged, diversified or reduced at will without producing any confusion of the contents.

The beginner cannot fully realize the many opportunities he will have to gather facts which he may find urgent need of at some future time. Much care must be taken to observe carefully, or the student will be liable to misunderstand the facts, and get wrong ideas to start with. An experienced designer of machinery in active service will seldom pass through a day of his work without finding himself wishing for knowledge on some point which can only be had from experience or experiment, and no mechanic can look back over his career without seeing many chances for getting facts which have been passed by without being taken advantage of.

I once heard a machinist ask a well-known mechanical engineer how to design a lathe. This was a very comprehensive question to be answered off-hand, as the machinist expected it would be, and it was with great interest that I heard the reply; for it seemed to me that there was little hope that much satisfaction could be given by any possible answer which might be made under the circumstances. The reply was, that the machinist's lathe was developed to its present form by experience through a long period of time, and the way to design a lathe was to become familiar with lathes then in use, and with that as a basis to design a lathe that should be stronger where they were weak, convenient where they were unhandy, more durable where the others showed excessive wear, and capable of doing a greater variety or quantity of work in the same time.

The answer seemed to satisfy the machinist, but it was of most interest to me as showing the opinion of an experienced and competent man on the subject of designing a standard machine, and as he has designed on this plan some of the most efficient machine tools now in use in this country, it is an instructive hint to beginners generally. The proportions of all staple kinds of machinery have been developed by experience, and there are many classes of machinery which reached the present form of utility many years ago; but for the designing of the same there have been no rules formulated and published that would be available to mechanics generally.

The most notable example of this that I know of is the machinery used in rolling-mills, and the only really successful designers of such machinery are those who have had many years actual experience in the use and observation of it at work.

There are no books published on the subject that give anything except general descriptions of such machinery, without any details that would be of service to a designer. This is somewhat remarkable when the length of time and the widespread use of such machinery is considered. Much of the same is true of iron-working machinery generally, such as lathes, planers, drills, punches and shears. The writer desired recently to get some information about the machinery and apparatus used in the manufacture of tin plates, but found there was only one book on the subject had ever been published, and although this contained considerable general information, there was absolutely nothing in it that would enable a designer to determine the sizes or proportions of a single piece of apparatus for the purpose.

The present method for the manufacture of tin plates has been in use about twenty years, and has been carried on in three different countries, and yet none of this valuable knowledge has ever been put into scientific shape so it would be useful to the designer.

About the only classes of machinery for which there are scientific rules for designing are steam engines, hydraulic machinery, air engines and motors and power transmission.

The foregoing facts are sufficient to show the student that much of the knowledge needed by a mechanical engineer must be acquired by experience, or by variously absorbing the results of others' experience. I cannot attempt to give an enumeration of the many facts which should be observed, but can only hint that the student should take every opportunity to note the speeds and capacity, the power required to operate, the width of belt and diameter of pulleys, or the diameter, pitch and face of gearing doing a given amount of work, the dimensions of the principal parts which transmit the strains, the size and speed of bearings, and so forth, and he need not fear that he will accumulate too much data of this kind, provided he properly classify and index it. It sometimes happens in designing that if a sure knowledge can be had of the correct dimensions of one or two principal parts, all the rest can be determined from these by calculation with sufficient accuracy to be practical, and therefore the importance of data of that kind cannot be too strongly impressed on the mind of the learner.

Lloyds have issued a circular calling attention to the straining which takes place in the structure of petroleum bulk steamers through the improper use of water ballast. The circular says: "Sufficient care has not been taken to insure that the tanks have been quite filled, and kept filled; and a deep empty tank has even sometimes been run up at sea while the vessel was encountering heavy weather. By these means great strains and damage have been caused from masses of free water being brought against the bulkheads internally. Carrying liquid in bulk, independently of the nature of the cargo, causes considerably more straining on the plating and riveting of vessels than would occur in carrying general cargo. Provision should be made so that the consecutive tanks in the midship part can be quite filled. These spaces should be subdivided, particularly at the fore end, to such an extent that the trim of the vessel will admit of the tanks being quite filled, without the statutory depth of loading being exceeded. Experience has also shown that danger arises from not filling the water spaces at the end of the stokehold with water, so as to prevent oil finding its way into the coal bunkers and saturating the coals."

European nations are putting in efforts to keep out pauper emigrants. In other words, they are secluding themselves more and more year by year.

The Pennsylvania Railroad Company has nearly 14,000 miles of track.

Sixty-ton Hydraulic Wheel Press.

We illustrate herewith a hydraulic press specially adapted to the work of pressing into place boxes of vehicle wheels, and forcing on the hub-bands.

Owing to the fact that the pressures employed in this work are comparatively light, many machines for this purpose have been constructed with wooden frames, or with frames composed partly of wood, with the result that springing has occurred, and the machines have, in some instances, failed to work as well as a machine should be expected to work that is composed entirely of iron and steel, as in this instance.

The ram in this machine, which is 8″ diameter, is placed below, the wheel resting directly upon it, while above there is a 3″ adjusting screw, which can be moved by the hand wheel shown, to adapt the space to any length of hub, thus doing away with all necessity for blocking up.

The pump, which is made of phosphor bronze, is placed below, within the liquid reservoir, and is very simple in construction, having but two valves, which are made of steel balls resting upon substantial seats. There is a relief valve which opens when the desired maximum pressure is reached, and allows the liquid to flow back into the reservoir.

The pump is driven from a shaft at the top of the machine on which there is a friction clutch, by which the motion of the pump is at all times under perfect control of the operator. The pressure gauge shows both the total pressure upon the ram in tons, and the pressure per square inch.

The machines are intended to work up to 60 tons pressure and are tested up to 80 tons. The weight complete is 3,600 pounds, and the builders are the Defiance Machine Works, Defiance, Ohio.

SIXTY-TON HYDRAULIC WHEEL PRESS.

On the Development of the Inventive Capacity by the Solution of Constructive Problems.

BY LEICESTER ALLEN.

Ill health and a pressure of business resulting therefrom have prevented my sooner attending to some correspondence upon this subject, forwarded to me by the editors of the AMERICAN MACHINIST. This must be the apology for my apparent neglect.

Mr. W. P. Tarbell, of Milford, N. H., whose drawing seemed to me to represent substantially a gear wheel with two teeth, and was accordingly excluded as not conforming to the requirements, has kindly sent a model, which works very well, and accomplishes the intermittent movement with a definite pause between each reciprocation. He thinks that both the drawing originally sent, as well as the model (in which one of the arcs between the two teeth is filled in), fulfill the conditions. It is perhaps more a feeling on my part that his solution has an analogy to a gear wheel or cam, than any argument I can give, that leads me still to think that in the first form —the drawing —the analogy to a gear wheel was too conspicuous, and that in the model his rotating disk is essentially a cam. However, I give a drawing of the model in Fig. 1, that others may also decide whether or not my view is correct.

The frame *a* slides on the rods *b*, being actuated by the rotating piece *c*. This may be made either solid between the angles *d d′*, or it may be cut out between these angles, as shown by the dotted outline. The piece *c* acts against friction rollers *e e′*, pivoted to the sliding frame *a*. The bone of contention is the piece *c*. What shall it be called? If cut out, as indicated by the dotted outline, is it, or is it not a mutilated gear wheel? If not so cut out, is it or is it not a cam?

Mr. Tarbell makes, in his letter, some very interesting and valuable suggestions with reference to the discipline derived from this kind of study, and I thank him for them. They will all be duly considered in future work in this line. It appears, however, that he would make good mechanical construction a desideratum, and I will so far agree to this, that any solution that includes the best mechanical construction, while not violating the conditions of a problem proposed, ought to be considered the best. He points out one feature of his arrangement that might be valuable in some applications of the movement; to wit, that when the piece *c* is not cut away, as shown by the dotted outline, it will hold the slide in a positively fixed position during the entire interval of rest, the latter being the time occupied by the angle at *d′*, to traverse the arc between *e* and *e′*.

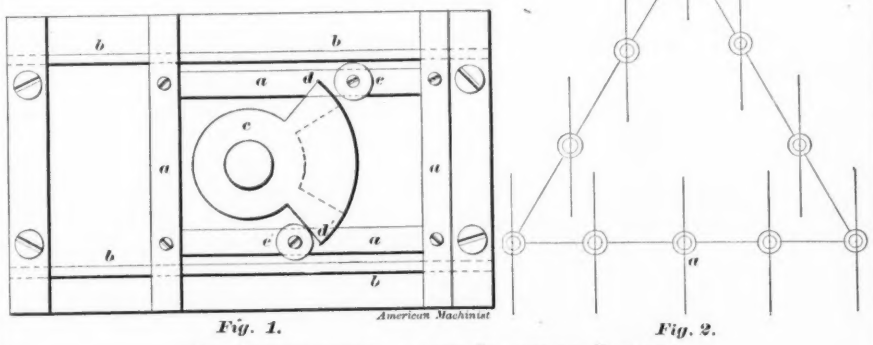


Fig. 1.

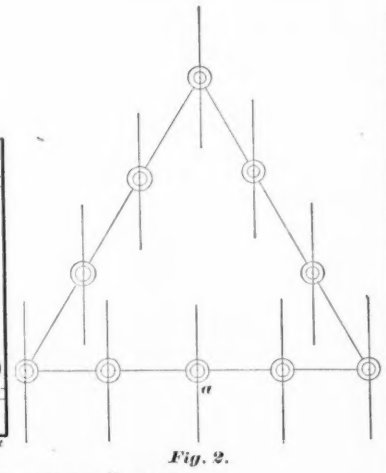


Fig. 2.

THE DEVELOPMENT OF THE INVENTIVE CAPACITY.

Mr. Tarbell also hopes that what really "constitutes a gear movement may be further ventilated"—a hope in which I share heartily. The definitions of mechanical movements are far too incomplete, as found in the books, and Mr. Tarbell thus suggests an interesting and profitable line of discussion.

As an example of defective definition, I extract a definition of "*cam*" as given in a recent dictionary:

"*Cam. n.* In *mach.*, a device for converting a regular rotary motion into an irregular, fast and slow, intermittent rotary, or reciprocating motion."

It is true that a further explanation is given in cuts illustrating cams; but the cuts cannot be quoted. The definition is scarcely more satisfactory than would be a definition of a *ship* as a means for floating bodies on the surface of water. In future problems I shall take care, when naming any mechanical movement, to define what I understand it to be, and thus avoid a varying conception as to signification of terms.

Mr. Charles C. Bosworth, of West Grafton, W. Va., in an interesting communication, points out the analogies between the movements accepted as solutions, and cams and gear wheels. In support of his views, he quotes substantially the definition above given, and it is evident that he, as well as all the rest of us, are embarrassed by our differing conceptions of what may be properly included in the meaning of these terms. He sends several sketches illustrating modifications of Mr. Powers' solution (Fig. 4, issue of Nov. 5, 1891), only one of which, in principle, varies from that of Mr. Powers, and this one appears to me to be, in principle, exactly like that of Mr. Tarbell, above discussed. Mr. Bosworth says he "would like to know how to reconcile these apparent similarities to the restrictions" given in my problem, and just where a differentiating line can be drawn between a gear wheel and a cam, or between a disk having a pin or pins working against lugs, as shown by Mr. Powers and others, including himself, from a true rack-and-pinion movement, since to convert Mr. Powers' movement into a rack-and-pinion movement requires only a multiplication of both pins and lugs, all of which is entirely pertinent to the inquiry. These questions can only be answered by more exact definitions of the movements, and such definitions, based upon a consensus of the opinions of the intelligent readers of the AMERICAN MACHINIST, would, I think, be of great value.

Evidence that there exists a confusion of ideas among us is also contained in a communication of Mr. A. F. Mowry, of Holyoke, Mass. He is kind enough to approve my defense of the crank-and-pitman phase of the discussion, thereby tacitly admitting the validity of the position I took, that Mr. Powers' solution included a crank, and that a crank *per se* was not among the prohibited devices; but he immediately perceives an analogy between the disk with a pin in its face to a rack and pinion, and from this it logically follows that there must also be an analogy between a crank and a rack and pinion.

It appears, therefore, that what a mechanical movement accomplishes governs its classification in some minds more than the thing itself. The definition of a cam quoted above, in my opinion, covers a crank and pitman nearly as well as a cam. It is not what these things do, but their construction, that, I think, should form the basis of the definitions.

Mr. Mowry points out in his letter that an ordinary belt with a lug fastened to its outer surface may be substituted for the endless chain proposed in some of the solutions, sprocket wheels being replaced by smooth-rimmed pulleys, and I think this a good suggestion. Two original solutions sent by him may have been misunderstood by me, but, as shown in his sketches, it appears to me that they would not cause the slide to move uniformly between the periods of rest, and this was a requirement of the problem.

Mr. J. L. Dean, of Worcester, Mass., sends so neat a tracing, and such an ingenious method of effecting the desired movement, that I would be glad to include it among accepted solutions; but it fails in one important particular. The parts that immediately move the slide (they are what Fairbairn calls *flexible connectors*) reverse, and have an intermittent movement, which was prohibited in restriction No. 6.

Mr. William F. Torrey, of Providence, R. I., sends a solution corresponding with the solutions using the endless belt or chain, differing, however, from any of the others, by placing one sprocket wheel below the line of movement of the slide, and the other above it, the lug on the belt being thus alternately worked off from the projection on the slide. The solution is entirely correct, as regarding both the requirements and the restrictions.

A solution from D. A. Carpenter, of Fort Collins, Colorado, is also correct, and in conformity with the conditions of the problem. In this solution an endless belt or chain is used, the belt, however, being crossed between the pulleys, and the lug being attached to the exterior surface. I can see no good purpose resulting from crossing the belt.

Another evidence of the confusion as to exact definitions of movements is furnished in a communication from Mr. W. H. Waite, of Rose Polytechnic Institute, Terre Haute, Ind. He thinks there is an analogy between Mr. Powers' movement and a crank and slotted crosshead, a view which, as a slotted crosshead must have a slot and as there is no slot in Mr. Powers' movement, is, I think, hardly tenable.

As no solution to the problem offered by me in my last article (issue of Dec. 3, 1892) has come to hand, I will, unless a solution should yet arrive give such a solution in due time.

Herewith I propound another problem, and in this, I think, no misunderstanding will occur, since no limitation is made with reference to mechanical devices, except as to the number of moving parts.

In Fig. 2, *a* represents a needle supported in the middle. It is required to make the center of this needle describe the equilateral triangle indifferently in a circuit in either direction, the motion to be theoretically continuous, and the needle in any of the points in the path described to remain in a position parallel to its position at any other point, as indicated in the diagram.

RESTRICTION.—The movement is to be accomplished by not more than four moving parts or elements exclusive of the needle, and any known or now unknown mechanical movements may be used.

A New Cutting-off Machine.

We give with this a general and a detailed view of a cutting off machine, which is provided with a device by which the motion of the spindle is accelerated as the tool approaches the center of the stock, and the cutting speed is thus kept at about 25 feet per minute until the tool is within $\frac{3}{8}$" of the center.

The means by which this is accomplished will be readily understood by an inspection of the detail view, in which *D D* are disks of iron covered with hard leather, and driven in opposite directions by an arrangement of quarter-twist belts. Between these disks is a smaller cast-iron disk, to which motion is given by the two large disks which are forced upon it by the action of a spring. This smaller disk is moved to or from the center of the larger ones by a cam on the back tool slide, so that as the tool approaches the center the speed is increased.

Motion is transmitted from the small disk to the spindle by a train of gears, which are in the ratio of 8 to 1, so that the driving power is ample.

A wedge operated by a convenient lever is used to separate the large disks, thus stopping the machine, and allowing the tool slides to be placed in any position.

As would be expected, it is found that this device results in a very great increase in capacity, and the machine cuts easily three square inches of stock per minute. The accelerating device is the invention of Mr. Eugene Childs, and the machine is made by the Hurlburt-Rogers Machine Co., South Sudbury, Mass.

An Electrical Fog Bell.

The port of Ravenna, in the Adriatic, has recently been provided with a fog bell, the invention of the Abbé Ravaglia, and worked by electricity. It is situated at the end of the mole leading into the harbor, and the current is conveyed to it from a battery in the lighthouse about a kilometer distant. The apparatus for striking the bell consists of a magneto electric motor planted in the bell tower, and connected to a mechanical puller. When the current from the battery passes through the armature of the motor, the motion of the armature is caused to turn a disk having pins projecting from its border. These pins catch on the end of a pivoted lever as the disk revolves, and by raising one end of the lever depress the other, thereby pulling the bell chain and making the hammer strike the outer rim of the bell. A rapid series of strokes is the result, and the loud continuous note is heard for a long way. The battery employed is the constant form of Daniell, and a galvanometer is kept in the circuit to show that the current is of proper strength. A telephone circuit also enables the attendant at the lighthouse to hear the "drone" of the motor, and thus know whether it is working at its proper speed. Such an apparatus is, under certain circumstances, cheaper, simpler and more convenient than a steam siren or a bell actuated by the waves.—*London Times.*

JEWELERS' ROLLS.

Jewelers' Rolls.

We illustrate herewith small rolls intended for jewelers', dentists', and other similar work. A feature of the machine is in the fact that in the frame above the rolls there is an opening large enough to enable the rolls to be taken out by merely running up the adjusting screws. This adds very much to the convenience of the machine when rolls are to be changed. The crank is made of a flat wrought bar which is held in place within a socket by a set-screw, so that when the machine is not in use, or is to be shipped, the handle can be turned around and made to rest upon the top of the machine. Springs are placed between the rolls, which keep them separated at all times, as far as allowed by the screws, this also adding to the convenience of operation. The rolls are $1\frac{7}{8}$" diameter, $2\frac{3}{4}$" long, and rolls of any desired form are furnished. The makers are the Iowa Machine Novelty and Brass Works, Des Moines, Iowa.

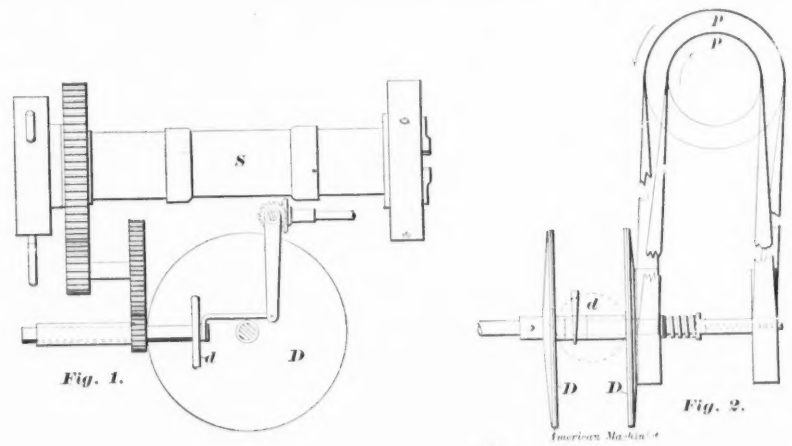
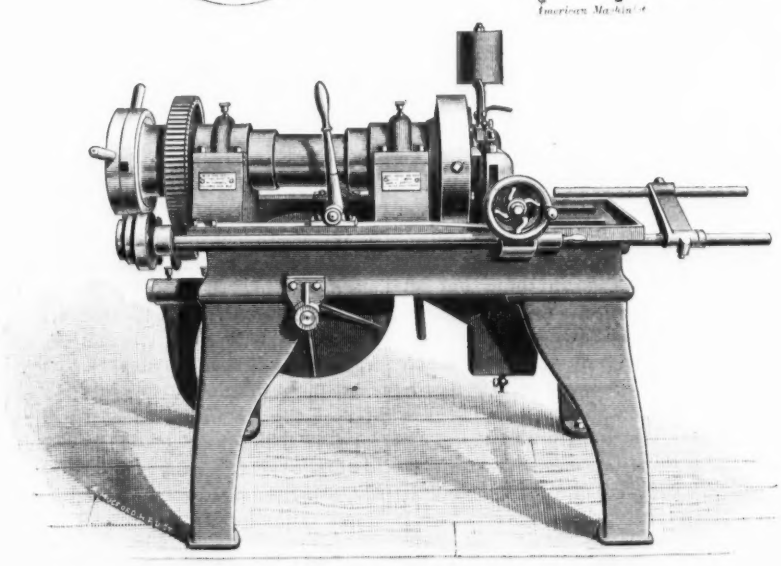


Fig. 1. *Fig. 2.*



A NEW CUTTING-OFF MACHINE.

An agent of the Hamburg-American Steamship line has been arrested for complicity in bringing emigrants to this country in violation of the contract labor law.

A Novelty in Lighthouses.

The stranding of the Eider on the British coast comes in time for a useful lesson. The fog had been so dense that she had failed to make out any of the powerful lights with which the Channel is provided. Some recent experiments have, however, served to show that the lights might have been so arranged that she could have seen them. The new method is to throw the beam vertically, illuminating the clouds and vapor above the lighthouse, instead of, or as well as, horizontally, these last beams to be quenched by the fog, when there is any.

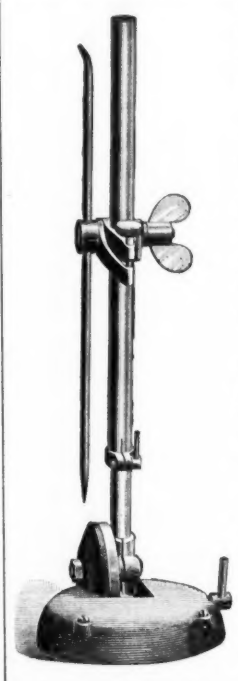
It is an illustration of an old but wise saying, that in applied science "everything that is is wrong," to note that the whole effort of lighthouse equipment has been to prevent the vertical escape of any part of the radiance as well as to concentrate it in the horizontal beam. The Eddystone light, with its nominal power of 5,000,000 candles, is visible on a clear night only 17½ miles.

A mile or so of fog will absorb the most powerful light. But fog thins rapidly as it rises, and rarely attains as much as 300 feet at its deepest. From the track of vessels buried in this cloud all but the lower part of a pillar of vertical rays ought to be visible.

At the Royal Naval Exhibition now in progress a young Scots shipmaster, who had worked out in his mind the true theory of lighthouse illumination, had the satisfaction of seeing it tested practically. The rays of a searchlight were projected upward and caught different layers of cloud at elevations of 1,000 yards and less. The beams were distinctly visible at from 34 to 50 miles. Yet the light used was a baby of 6,500 candles intensity, compared with the solar blaze of the Eddystone's 5,000,000 candles. The loss of the Eider has occurred most opportunely for forcing the new principle on the public consciousness in a way that may bear down the barriers of official obstruction. Should this ensue, Capt. Robertson, of the steamship Mogador, may well thank his luck for a chance at fame which visits few even of those who have cooled their heels for years in Admiralty waiting rooms.—*Evening Sun.*

The "Welles" Surface Gauge.

The accompanying illustration is of a new surface gauge, which has the standard fastened into a disk which is pivoted to an upward extension of the base in such a way that it can be inclined to any desired angle, and is locked in position by the clamping screw seen at the right.



The standard is made with a telescopic slide, the outer portion being made of hard brass, and with a split boss at the bottom, by which it is firmly clamped in place.

The head which holds the needle is so made that, when the thumb-screw is tightened, the first effect is to clamp the head to the standard with sufficient force to hold it firmly, after which a seat is obtained on solid metal, which prevents the brass tube being injured, and yet allows the needle to be firmly clamped. Under the washer through which the needle passes is placed a lever, the outer end of which is tapped to receive the small adjusting screw seen, which is supported in an extension from the head.

The ability to incline the standard enables it to be got into places where it would otherwise not be possible, and to use the needle on jobs which overhang the platen of the machine on which they may be placed. The extreme height of the standard is 18", and the shortest length 10". The needle can, of course, be adjusted after everything is tightened up, and it is not affected by lost motion in the screw. In the base there are two pins fixed, the heads of which are seen in the engraving, and look like screw-heads. These are pins which are split for some distance from the top, to enable them to hold in place by friction, and when pushed down they project from the base, and enable it to be passed along the edge of a platen to line up the work sideways. The gauge is made by Fred A. Welles, 423 East Water street, Milwaukee, Wis.

On one occasion in the old French war, the English, aided by colonial militia, were besieging a French fort somewhere in or near Canada. In front was a space of the forest leveled by a tornado, and beneath the fallen trunks the besiegers sought shelter from the sharp fire of the fort—all save one man. Like another Ethan Allen, he stood upon a tree elevated above the rest, returning the enemy's fire. His companions below hailed him to know if he had any bullets to spare, as they were out. The reply was, "Hang you, come up here; you can catch a handful a minute!"—*Argonaut.*

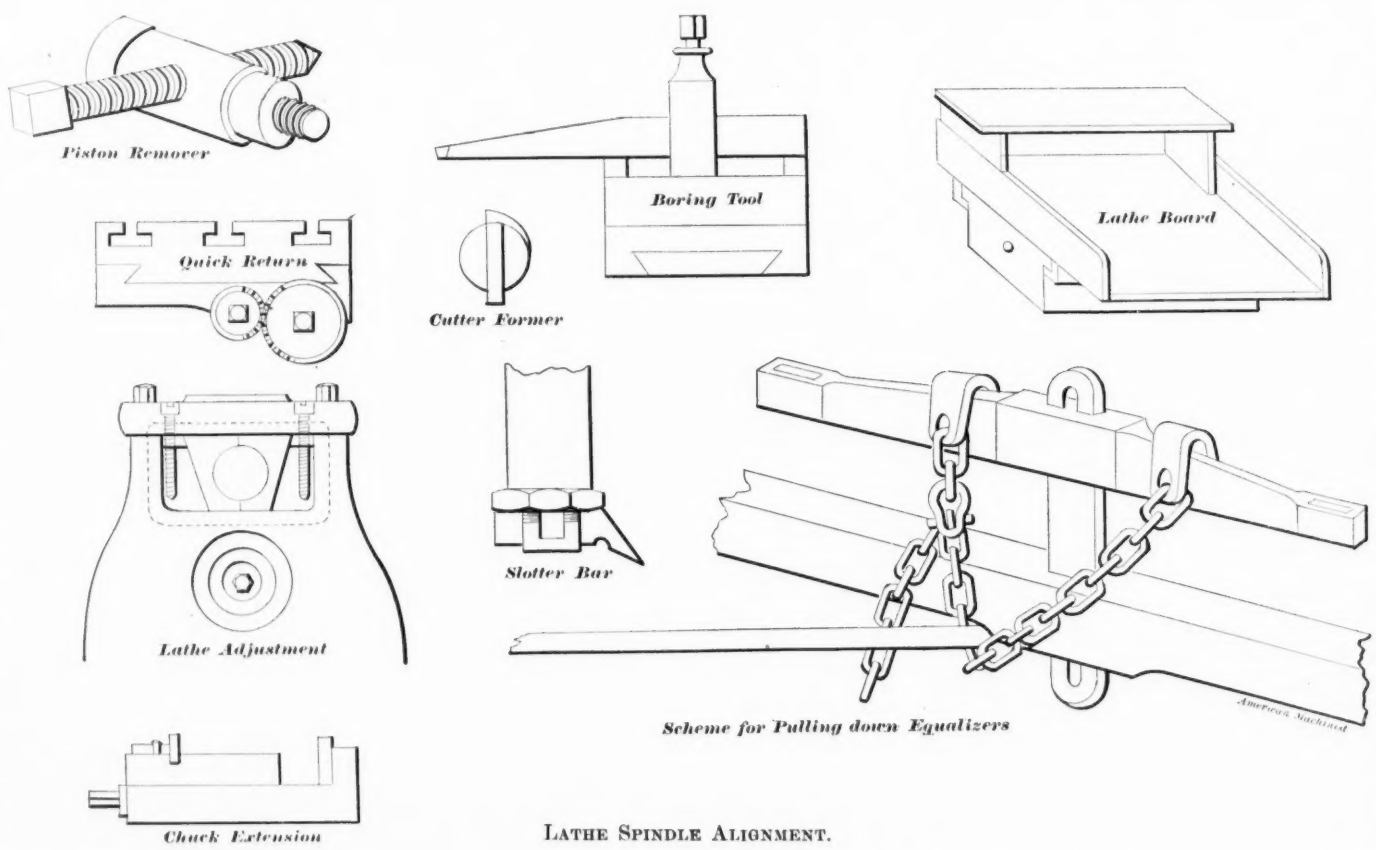
It is said that the biggest umbrella in the world has been made for the use of a West African king. The umbrella, which can be closed in the usual manner, is twenty-one feet in diameter, and is affixed to a polished mahogany staff of the same length. The canopy is made of India straw, and has a score of straw tassels, and a border of crimson satin. On the top is a pine-shaped straw ornament which terminates in a gilded cone. When in use, the umbrella is fixed in the ground, and under its shelter the king is able to entertain thirty guests at dinner.—*Dry Goods Chronicle.*

LETTERS FROM PRACTICAL MEN.

Lathe Spindle Alignment, Etc.

Editor American Machinist:

It may be assumed that most all machinists have had more or less experience with lathes which chronically and persistently bore taper. Practically, it appears to be a rare exception to find a lathe which will bore a straight hole. Many new lathes of standard make fail to do it. What condition they are in after six months' hard usage can be left to conjecture. Lathe spindles, originally in perfect alignment, must, from necessity, wear the head journal upward and away from the cutting tool. While it may be true that these errors are a necessary evil to a certain extent, it seems, however, that ordinary precautions could be taken to correct them as far as consistent. The Putnams have done a good act in their improved lathes, by having the tail-stock relieved from the shears when loosened. This prevents excessive wear, and its consequence, viz.: low center. I notice the taper bushing business is being rapidly introduced by a large number of machine tool concerns. I do not know whether they have done this at their own caprice, or whether the idea is backed by the machine operators. I have no means of finding out except by personal experience and that of others near me, and that gives a lurking suspicion that they do not perform the function intended. It looks as if the brass itself might be kept central; but what bothers the workman is, will it keep the spindle the same? And he guesses not, and longs for the old time-tried cap box, where an adjustment means something and you know it adjusts. Yet with either contrivance we fail to correct what I am trying to get at—that is, the alignment of spindle and how to keep them there; that is what machinists want to know.



LATHE SPINDLE ALIGNMENT.

I send you a sketch of a device which, no doubt, looks wrong in theory, but, however, might work better in practice. It is probable that this same scheme has been thought of many times; perhaps tried and abandoned. Yet I cannot get over the fact that something has got to be done to correct a very expensive practice, viz.: trying to bore a straight hole with a spindle out of line. Let the boys see the idea. If it don't suit 'em, perhaps the thing will be forthcoming. I haven't time to go into it any deeper.

Next to boring comes the boring tool. Some machinists think a boring tool is too small an object to require much theory in its construction. I sha'n't argue the point, but show you an outfit built upon the pyramid plan. There is no indecision about the action of this tool. You will observe the bottom of the tool is perfectly straight; the top has got something to hold on to, increasing in strength from point to tool-post. If the point enters the hole, we know the bottom will clear the whole distance; if the top is going to touch in the hole, it will be noticed at once.

We always have a certain respect for a good reliable turning tool, and always appreciate a decent place to keep it. I show you a very convenient tool board, built on the top story and basement plan.

I am not sure whether any of the boys will collect sufficient nerve to tackle the old man for one or not. If he does, and gets it, it will be found very handy, as its shape will readily suggest.

Try it and save time. Two gears, as shown, will bring that millling machine table back two or three to one, by merely changing the handle to the post desired.

I had imagined that the returns were all in concerning the slotter tool bar. However, I find another straggler seeking favor. I send you a sketch showing it. It is desirable in using slotter tools to have the tool as near the bottom of the bar as convenient. A set-screw in the bottom defeats this object—hence the different suggestions.

On the same sheet I show you how to increase the capacity of a milling machine vise, or others of the same construction. I trust the divulgence of this idea will in no measure cause a panic among the makers of such chucks, but just merely to induce them to add a little capacity to them for the money invested.

As the old-style flue hole cutter is still in existence, considerable time may be saved in filing and fitting tool to track properly if a block be made, as shown, so the blacksmith can forge it right down to the correct thing. We, of course, understand that it will be necessary to have a block for each different diameter.

I see many pretty devices designed for removing piston rods from crossheads. I haven't found out whether they were (as Edison says) simple enough for a mule to work or not. During the interim, however, the device shown, an old pin tapped out for a screw, will push them right out; and when you pull it out of the big pile in the corner it will be all there ready for business.

I suppose every roundhouse man on earth, if the expression conveys anything, has gotten up the best spring puller, after considerable experience with a few. Please add the one shown to the numerous and remarkable collection. This, like the previous instrument described, contains the mule germ principle. It is the helpers' and chunkers' delight; no screws, no wrenches, safe, and gets there. The rod extractor I find in several shops. The spring puller, or equalizer puller, rather, is an old device at the U. P. shops here; perhaps in use at other places. Personally I have not seen it before.

L. C. SHARP.

Something About Treasurers.

Editor American Machinist:

I want to say a few words about treasurers. Treasurers may be roughly divided into two classes—those who know their business and those who don't; and it has always been a matter of surprise to me that those treasurers who are unsuccessful in managing manufacturing enterprises do not study the methods of those other treasurers who are successful.

The position of the treasurer who is to be a successful manager of a manufacturing business is unique. He must first understand his own business, and last, but by no means least, he must understand that he doesn't understand the business of the mechanical manager, or superintendent, or whatever you please to call him. These few (wise ?) remarks are intended to be introductory to a true story.

There was a company, and the company had a treasurer—probably because Massachusetts law compelled a company to have not less than three owners, and this company had only two other owners, the same being president and mechanical engineer respectively. I have seen a good many treasurers, but have never seen one whose feet looked better on a desk than this one, nor have I ever seen one who could write as long a letter without making any promises; he understood *this* part of a treasurer's business well. He was also a treasurerly looking man, and did the company honor in this respect; he looked very much like "the manufacturer" in one of *Puck's* tariff cartoons—but that is neither here nor there.

This company had a superintendent who understood his business; the company prospered. I can say in all seriousness that they had the model small shop of America, as far as I know, and I have seen a good many. There were about 150 men, and things just hummed, and because they hummed the treasurer shoved his feet up another notch on the desk, and presumably said to himself: "See what *I* am doing. What is the use of paying that greasy mechanic a big salary to boss those machine tenders out there; we will save that much, and the treasurer will be all in all!"

Well, you know the result. Same old story: The treasurer saved the difference between the high-priced man's salary and a low-priced man's salary, and this was only about three years ago, too; and how many men do you suppose they employ now? Fifty-eight by actual count within a week. "Oh, but," you say, "business has been quiet all around lately!" Just so; but let me tell you what happened the other day. A friend of the treasurer called, and requested that he be shown through "the works." All right! They started with the basement: engineer sitting on keg, smoking pipe. Into japanning room: japanner smoking pipe. Better luck up-stairs, guess! Up on elevator—'way to top floor, where patterns, etc., are kept: two fellows found hidden away in corners, smoking pipes—(treasurer beginning to get nervous.) Into "superintendent's" office: superintendent smoking pipe (meerschaum) and telling funny stories to "mechanical engineer," who was also smoking pipe (corn cob)—(treasurer tired)! Down into office again: Heavens! bookkeeper smoking T. D.

Please find your own moral. GREASER.

Babbitting Bearings.

Editor American Machinist:

In some of the August and September numbers of the AMERICAN MACHINIST your correspondents have given some experience and suggestions about babbitting bearings; but, as they related mainly to one kind of bearings only, it may be of interest to your readers to discuss some other methods in use.

One of your correspondents had difficulty in getting the babbitt to run up closely to the shaft so it would fit without scraping, but it is very seldom that this can be done. Cheap babbitt will generally make a more smooth and accurate bearing, because it is composed chiefly of lead and antimony, which does not require as high a temperature to melt, and does not shrink as much.

It is sometimes desirable to babbitt a bearing which is solid or without a cap, and there is no way of making a good job of it by the ordinary methods. One method of securing the babbitt is to drill holes through the bearing to the outside, and countersink the holes, allowing the babbitt to run through and clinch, as it were, and if there are enough of the holes it will hold the babbitt; but it will then be found that the babbitt will not touch the shaft opposite each of the holes, because that part of the babbitt could not shrink away from the shell; and at other places it does, just enough to cause high spots which touch the shaft. Better results may be obtained by heating both the bearing and the mandrel almost to the melting heat of babbitt, and then pouring and allowing all to cool together. But even this will not give good results, because of the difference in the coefficient of expansion of the two materials. In work of this class it is usually not possible to hammer the babbitt in place and bore it to size, so a plan of broaching has been used with entire success. In this plan the babbitting is done on a slightly tapering mandrel, somewhat smaller than the size of hole wanted. This is removed, and a smoothly polished hardened steel broach, tapering at one end, and about half of it straight and of the size of hole desired, is forced through the hole, expanding the babbitt until it fills the shell snugly, and leaving a very smooth true hole for a bearing. Good judgment and some experience will be needed to determine how much allowance need be made for expanding; for, if too much is allowed the shell may be burst, or there will be too much force required to get the broach through, and the amount of expansion will also depend on the kind of babbitt used. It would not be successful with a brittle babbitt, as it would be liable to crack instead of expanding.

Engine bearings on some high class engines have been fitted with turned and bored

shells of brass or cast-iron lined with babbitt, the object being to have it so the shells could be removed and babbitted, and re-bored when the babbitt was worn out. On account of the cost of brass, cast-iron was used, and it requires considerable care to get the babbitt secured firmly to the shells. The shells are first tinned by heating them to the melting temperature of solder, and applying acid and solder, rubbing it thoroughly all over the surface with a large soldering copper. The shells are made either for half or quarter boxes, and are babbitted at the melting heat of solder, thus causing it to fuse firmly to the tinned surface. Holes are drilled in the shell before pouring, to serve as an additional security in holding the babbitt, as the tin does not unite very well with some kinds of cast-iron. Cast-iron boxes lined in this way have been successfully used in engine connecting rods instead of brass or bronze. Cast iron for this purpose has one serious disadvantage—when used on high-speed journals it does not conduct the heat away and diffuse it as rapidly as brass does.

About all the best high-speed engines have babbitted brasses on the crank-pins, and these are prepared by boring the brasses to a size to allow the proper thickness of babbitt, after which they are tinned on the bore in the same manner as cast-iron shells, and are poured while at the melting heat of solder, the babbitt adhering very firmly to the brass. As a matter of precaution, some drill holes or plane shallow grooves across, to prevent the babbitt turning, but this is not necessary if proper care is taken in doing the job, for the babbitt unites so firmly with the brass that it cannot be separated without melting. No hammering of the babbitt is needed when it is soldered to the box, as that prevents it from contracting.

A large bearing should not be hammered with a light hammer, as it may only stretch the surface, and, after boring, it may be loose in the bearing. The most effective way is to use a broadly rounded set with a sledge, which will force the metal firmly to a seating.

In babbitting plain, flat surfaces, like a crosshead bearing, hammering does not do any good, usually, and it is best to depend on liberal sized tapering dovetailed grooves for holding.

A considerable reform could be accomplished in the tools commonly used in doing babbitting, for I have noted that nearly all such appliances are mere makeshifts gotten up by the man who is doing the job, and generally thrown aside, to be lost before wanted again. A great saving in time and much better work could be done by providing well-designed jigs for holding the mandrel and the piece operated on. I know of a jig made for babbitting crosshead slides having saved over half the time usually consumed on the job, besides producing more accurate work. Also a jig for babbitting pillow block bearings was a most satisfactory and economical appliance.

A. R.

Graduations on Taper Attachments.

Editor American Machinist:

In your issue of November 26 Mr. Colvin tells of a 4″ steel rule having a variation of $\frac{1}{64}$″ between the first $\frac{1}{2}$″ and the last $\frac{1}{2}$″ on it.

You would not advise any one to trust that rule much, or to set by it on any job that must come within $\frac{1}{64}$ of an inch.

In your answer to J. R., No. 505, second division, you told him you would set by the graduations on the taper attachment.

If you had a hole one foot long, 3″ taper, to bore, and had to fit a piece to it reasonably good, without "cut and try," when you came to putting them together you would wish that Mr. Colvin had got that rule and sent it to you, and you had used it, instead of the graduations on the taper attachment.

I have much respect for the AMERICAN MACHINIST, and place confidence in the answers given, and so feel sure your answer was not based on personal observation, or it would have been different.

There are several things very bad about these graduations:

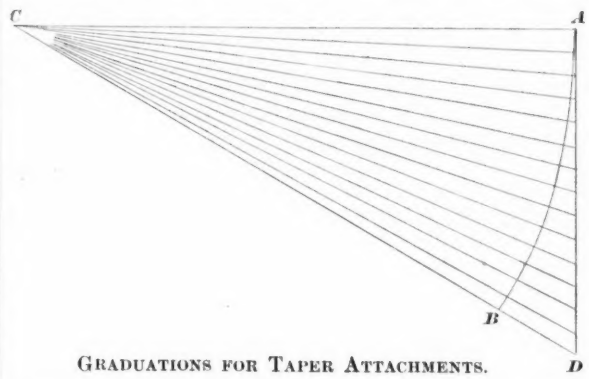
The faults may be common to all other makes of lathes with taper attachments, but I have not had experience with any other.

Very accurate work can be done on these lathes, and the graduations are useful to help to get to the same place more than once, but are far from telling the taper to the foot.

If both sides of zero show the same amount of taper per foot it would not be so bad; but they do not, and the difference is quite an amount for such work.

I will try to show what I find to be the trouble.

The graduations of the taper attachment are on a circle, the center of which is the



GRADUATIONS FOR TAPER ATTACHMENTS.

point on which the attachment swings in setting to cut a taper.

Now suppose the attachment was far enough from the lathe bed to admit of being turned at right angle to the bed and attached to the tool-post carriage; the only motion of the carriage would be in and out.

If we move it so it will be $\frac{1}{32}$ of an inch away from this at 6″ from center of attachment, we get a taper of 384 feet to 1 foot of travel—quite a taper!

If we set so as to stand $\frac{1}{32}$″ from parallel, 6″ from center, we get a taper of $\frac{1}{8}$″ to the foot, $\frac{1}{384}$ part of what we had first—a slight difference with graduations of the same length.

It may be said no lathe can cut any such taper as the first. Of course not; but we do cut tapers of 1½″ in 2″ of travel, and the same trouble is found, only in a less degree.

If graduations are in a circle they must vary in distance apart to express the taper per foot.

The degrees on a compound rest will show my meaning.

If the taper is found for 1°, and 10 times that taper is wanted, 10° will not do, and I do not know any way to accurately find the taper from the degrees.

Perhaps it is within the range of mathematics to give figures to represent what it will be, but they would be in such shape as to be of no use to the workman.

If the graduations started on a line that was at right angle to the bed, if they pointed to the center and the gauge piece did the same, equal spacing would be right.

If the graduations are on a circle they must be unequally spaced to show the taper.

Perhaps some one acquainted with all the different methods of graduating can tell us whether either of these ways is within the range of any of them.

The other defect of the present system is that the sides do not give the same taper.

If zero was the same distance from the ways that the center of the attachment is, a given motion on either side of it would represent the same taper.

Or if both ends of the attachment were graduated alike on one side of zero and the same side of the attachment, the same result would be reached.

We can't get along without the taper attachment—it is a great improvement over swinging the head-stock or pushing over the tail-stock, but I can't figure tapers from the graduations on ours, and feel like taking off my hat to any one who can, if he hammers out a living running a lathe and using one.

TAPER JOINT.

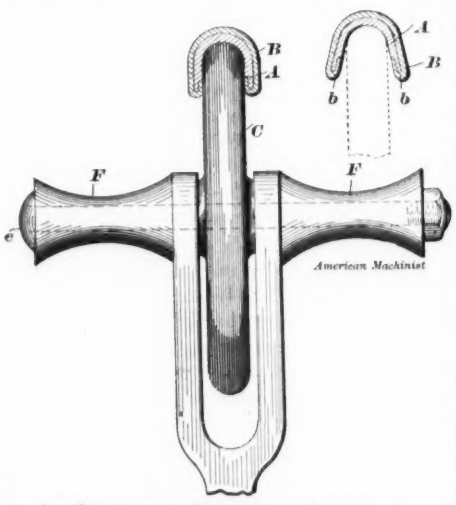
[The answer referred to by our correspondent was written by a mechanic who has had considerable experience in the use of the taper attachment, though not on the particular make of lathe referred to in the question.

Slate taper attachments are not usually graduated, nor intended to be used for tapers greater than 2″ to the foot, and it is my belief that when tapers greater than this are to be turned or bored, some other plan should be resorted to, not because the taper attachment could not be graduated for greater tapers, but because a greater taper imposes upon the carriage a greater cramping strain than is advisable under ordinary circumstances. Within these limits some taper attachments, at least, are reasonably true to the graduations, accurate, at least, within the limits naturally expected in such work; for we should not expect any graduations, even if theoretically correct, to give accurate fits without any of the "cut and try" process.

The angle to set a compound rest to for boring or turning a given taper per inch is easily found, and it can be done by any mechanic understanding the ordinary rules of arithmetic. The rule for it is given in the answer to Question 395, issue of October 24, 1889.

It is to be remembered that any errors made in setting either the taper attachment or the compound rest are doubled upon the work when a given taper per foot is required, and this adds to the difficulty. It would undoubtedly tend toward greater accuracy if manufacturers in graduating taper attachments would pay attention to this matter, instead of simply making the spaces equal and calling it right.

When the graduations are not properly put on, the lathesman may correct them by rigging up a device arranged on the principle set forth by the accompanying diagram, in which *C* represents the center of the taper attachment, *C A* the center line of the bar,



AN INSULATED TROLLEY CONDUCTOR.

the arc *A B* the end of the bar, and the line *A D* a scale placed at right angles to the center line, or tangent to the end of the bar at the zero point. Equal divisions being marked on this scale, a straight-edge with one end kept at *C*, while it is placed successively over the divisions on scale *A D*, will cross the arc *A B* at the proper points for the divisions. To be correct, all Slate taper attachments should be graduated on this principle.—F. J. M.]

Some Information About Patents.

Editor American Machinist:

The Commissioner of Patents has recently rendered a decision of considerable interest to inventors. It is found in Vol. 57 of the *Official Gazette*, page 692, ex parte Drawbaugh, and is to the effect that if, after an inventor has perfected his invention, he delays for several years to make application for patent, and, for more than two years before he does make such application, some other person puts that invention into public use, even though it be without the knowledge of the first inventor, the first inventor cannot obtain a patent. Until a few years ago it was generally understood that the unauthorized or surreptitious use of an invention for two years or more before the true inventor filed his application could not prevent his obtaining a valid patent.

Then came the Supreme Court, deciding that it made no difference whether the inventor authorized the use or not; if that use continued for two years before he applied for a patent, his patent, if granted, would be void. Still there was some ground for supposing that a fraudulent use for two years before application would not defeat a patent. Now, however, the Commissioner of Patents has decided that any use for two years, fraudulent or other, will prevent the granting of the patent if the fact becomes known. This is additional reason for diligence in applying for a patent after one has perfected his idea.

D. WALTER BROWN.

An Insulated Trolley Conductor.

Where high tension electric currents are to be carried over wires for the purpose of lighting, or for running stationary motors, it is, of course, possible to effectually insulate them and reduce the danger of fires and other casualties to a minimum; but where the current is to be delivered to a trolley which passes along the conductor, as in the case of street cars, this has heretofore been found to be impossible, with the result that accidents have happened, not only from direct contact with the trolley wires themselves, but also from contact with other wires which have in some way come into contact with them, and thus diverted a part or the whole of the current.

The accompanying illustration is of a device recently patented by Mr. Charles E. Sargent, of Chicago, Ill., the object of which is to do away with this danger by making the conductor of such form that nothing but the trolley can come into contact with it. In the illustration *C* is the trolley wheel, and *A* is the conductor, which is first formed into a flat sheet or strip, covered with insulating material *B*, and then bent into the form shown, the result being that nothing can come into contact with the conductor unless it be of the form of the trolley wheel, and another wire falling across it is effectually insulated from it. The spools *F F* are also made from insulating material, so that the motor-man in placing the wheel is in no danger, since no current can be taken until the wheel is properly in place, the spools *F F* coming into contact with the edges *b b*, unless the wheel is properly placed. Such a conductor ought to be produced at a reasonable cost, and, as it seems well adapted to do away with a large share of the danger attending the transmission of electricity, it seems worthy of attention on the part of those interested.

The Chicago Elevated Terminal Railway proposes to build one of the largest and handsomest stations in the world. It is this railway that is to provide an elevated entrance to Chicago for the Atchison, Topeka & Santa Fe. The plans call for a main passenger station (to be located at Twelfth and State streets), 350 feet long and 8 stories high above the level of the tracks, or about 9½ stories in all. The train shed is to be 1,000 feet long and to have 14 tracks. At convenient points along the road eight-story warehouses are to be erected. Each will be provided with two elevators, on which wagons and teams will be hoisted and let down. The freight warehouses will also be provided with elevators for lifting freight cars. Hydraulic power will be used. The station and freight houses are to be built very much on the plan of those belonging to the Philadelphia & Reading Railroad at Philadelphia and of the Pennsylvania at Jersey City, but on a more imposing scale. —*Evening Post.*

AMERICAN MACHINIST

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Machinery and Intelligent Labor.

It can, we think, be clearly shown that machinery, even though it does automatically what has been previously done by hand, does not work injury to working people, but, on the contrary, benefits them and constantly enables them to keep a little ahead of other forces which are always tending in the opposite direction. This we believe to be true of all workingmen; but it must, we think, be especially true of machinists, who are, and of necessity must be employed in the making of the machinery which is apparently to displace, but really opens up new fields of labor.

It was, therefore, with some surprise that we listened recently to the experience of a machinist who is introducing a new lathe tool of his invention. He said that in some shops the tool was objected to by the workmen because it saved work. We believe that there are very few American machinists who entertain any such sentiments with regard to new improvements. The vast majority of them welcome any improvement which facilitates their work, and would regret to take any backward step. It would seem as though the men who are employed in producing improved machinery should be the last ones on earth to object to its use, for their employment depends directly upon the employment of such machinery. It happens that the same man who is introducing this improved tool mentioned above, built the first few experimental machines of what is now becoming the standard machine for canceling postage stamps upon letters in the post-offices. This work has until recently been done entirely by hand, and in a very inferior manner compared to machine work But suppose that the men who have been doing this canceling should object to the employment of the machines for the work, and should succeed in getting their way about it; would this not be a direct blow at the machinists' business? The fact is that such monotonous and unskilled work as letter stamping ought not to be done by men who have reasoning faculties which they can apply and make use of in earning a living; and much the same can be said of any operation which can be performed by machinery. In other words, anything which can be done by automatic machinery is necessarily a monotonous employment, which, when once learned, is simply a repetition of the same thing hour after hour and day after day, and its accomplishment by machinery sets free, and, in fact, forces men to seek employments in which there is some use for brains and the exercise of discretion and judgment, for which in the main they will receive pay accordingly. For it is to be remembered that machines can never be made to think, and there will always be plenty of work to do by those who can think to some purpose, or, in other words, apply their brains to the performance of operations which machines, having no brains, can never perform.

The molding machines which are coming into use in foundries, for instance, will never do any work except that of the simpler kinds and pieces which are made in great numbers exactly alike. All the higher class of work in the molders' trade will be done by intelligent and skilled molders, just as it is now done, while those men who are content or who have no ambition above making brake shoes or grate bars, day in and day out, will be forced into higher grades of work, in which they can take more interest and for which they will receive better pay, while the cheapening of machinery, resulting from the cheaper production of the commoner grades of work by the machines, will tend directly to the more extended use of machinery and to the still greater demand for the skilled molder's services.

Electrical and Mechanical.

An electrician has an article in a recent number of the *Electrical World* on "The Uses of Electricity in a Modern House." There are some very entertaining things about some of the illustrations accompanying this article. For instance, there is what purports to be a portable fire engine which consists of a small four-wheeled truck, on the platform of which there is an electric motor and a centrifugal pump. The suction pipe for this pump enters the case at the periphery, while the delivery pipe comes from the center. In another place is a picture of a small ice cream freezer, driven by a motor, and the train of gears by which motion is transmitted is a wonder, the high speed gearing next the motor being capable of transmitting at least fifty times as much power as the bevel gears which are attached directly to the freezer.

Your true electrician, however, despises such details of engineering as would be involved in getting these things somewhere near right, while on the other hand too many mechanical engineers, perhaps, who see such performances by electricians, conclude that all claims made by such men for electricity are to be regarded with suspicion.

The fact is, however, it seems to us, that this incident and many others that might be given, show simply that when the electrician has gone so far as to produce the dynamo, which, when driven at a certain speed, will give him the current required, or the motor, which, when supplied with a certain current, will revolve its shaft and develop a certain number of foot-pounds of energy per minute, he has gone as far as he can go unless he is something more than an electrician, and as far as he ought to attempt to go without special training in machine design; in other words, without being more or less of a mechanical engineer. We do not doubt that the writer of the article in the *Electrical World* is a good electrician, and could be depended upon to tell us just what a motor might be expected to do in the situations referred to, so far as furnishing power is concerned; but what mechanic, after seeing his pictures, would be willing to take his estimates as to what the combination of a motor and a centrifugal pump, ice cream freezer, or any other piece of machinery would do?

When all the electricians have learned that there are limits to the science of electrical engineering, that there is a great deal to be learned in purely mechanical engineering, and that no man can understand anything of the latter science simply by intuition or as the result of some study and practice with dynamos, wires, etc., it will be easier for electrical and mechanical engineers to work together to some purpose and for the good of both.

When a brakeman fails to "go back" to protect his train, and an accident results from his failure, we all hear of it, but we are not so apt to hear of the many cases in which they do go back in the face of difficulties of considerable magnitude. A brakeman, whose name is given as M. S. Cole, went back from a C., H. & D. train, near Dayton, Ohio, recently, during the intensely cold weather, and held his position on the track until so badly frozen that his life is despaired of, and at least he will lose both his feet. Such a man is a real hero.

Boston merchants take a sensible view in their request that the government return to the issue of fractional currency. One firm says it receives often as much as $50 a day in the way of postage stamps, and that it is impracticable to get rid of this amount. There is but little doubt that it was a mistake to discontinue the issuing of fractional currency, as it was an undoubted convenience in the way of transmitting small sums of money.

The recent cold weather froze the water in a tank at the works of the Singer Company at Elizabeth, bursting the tank and flooding some of the departments of the factory. Good practice calls for a steam pipe in such tanks as are exposed to freezing temperatures, and its use during extra cold weather.

It seems to be a bad year for bridge schemes. The Senate Committee on Commerce reported adversely upon the bill granting the New York & New Jersey Bridge Company permission to build a bridge across the Hudson River. There may be something in the bill that is objectionable, but there ought to be nothing put in the way of a company's bridging the Hudson River at any point, provided it is done so as not seriously to impede navigation.

Mr. James E. Greensmith, who for several years past has been chief draftsman and engineer for the Pond Machine Tool Works at Plainfield, N J., will leave in a few days to become general manager of the Portland Works, Portland, Maine. The Portland Works employs about 500 men on general machine work, and the new position is a distinct advance for Mr. Greensmith.

Literary Notes.

MACHINERY PATTERN MAKING. Containing full size Profiles of Gear Teeth and fine engravings on full page Plates, illustrating Manner of Constructing Numerous and Important Patterns and Core Boxes. By P. S. Dingey, Practical Pattern Maker and Mechanical Draftsman.

The practical experience of the author has enabled him to treat the subject of pattern making in a thorough practical manner. Although the elementary part of the business has been omitted, and no cast-iron rules as to the methods of doing work have been laid down, the suggestions which are given and the discussion of methods will convey much valuable information and useful hints to the beginner, as well as to those advanced in the business. The author does not attempt to teach pattern making, as this, in his opinion, can never be done through a book; but his notes relating to the pattern maker and his trade; position, size and requirements of the pattern shop; marking and recording patterns, followed by the description of methods of doing work, cannot fail to be instructive. The book also contains a table of diameters of wheels at the pitch circle from 11 to 300 teeth; tables of weight of cast-iron of various forms, such as balls, pipes, etc., and other useful tables. The end of the book is devoted to the illustration of a number of teeth, laid out, full size, from one inch pitch to three inches, advancing by quarter inches. There are fourteen separate teeth in each pitch, suitable for gears having from fourteen to eight hundred teeth; they have been laid out from Prof. Robinson's Template Odontograph, and are interchangeable. These illustrations will be a great aid in laying out ordinary gears, and with their use much time and labor can be saved.

Much of the matter was written originally for the AMERICAN MACHINIST; this with the additional matter and other valuable items, will undoubtedly be of interest to pattern makers and those of the machinery business generally. The book is published by John Wiley & Sons, 53 East Tenth street, New York. Price, $2.00.

MODERN PRACTICE OF THE ELECTRIC TELEGRAPH. A Technical Hand book for Electricians, Managers, and Operators. With 185 illustrations By Leonard Pope, Past President of the American Institute of Electrical Engineers; Member of the Institution of Electrical Engineers (London). Fourteenth Edition, Re-written and Enlarged.

This is an important and comprehensive treatise on the Modern Practice of the Electric Telegraph. It is written by a recognized authority, who states the subject in a clear and concise manner. It treats on the fundamental principles, nature of electricity, sources of electricity, theory of quantitative electrical measurements, the laws and conditions of electrical action, the laws of electromagnetism, telegraph circuits, equipment of American telegraph lines, testing telegraph lines, and concludes with hints to learners. The work is eminently practical, and is not only suitable for the advanced student, but it is an excellent book for a beginner. It treats of the details of modern construction, gives data and tables, the whole forming a mine of information and a book of reference. We do not hesitate to recommend it; its value to those who are in any way interested in this subject cannot be over-estimated. The book is published by D. Van Nostrand Company, 23 Murray street and 27 Warren street, New York. Price, $1.50.

We have received a copy of the *Engineers' List*, published by Geo. I. Roberts & Bros., 471–473 Fourth avenue, New York. Mr. T. G. Oakes, of Jenkins Brothers, 71 John street, New York, is, we believe, largely instrumental in the "getting up" of this publication. It is, as we understand, to be issued as a monthly, and the first number indicates that it will be of assured value to engineers and mechanics.

A letter to the publishers will find the terms upon which it will be supplied.

Questions and Answers.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(46) J. M., ——, asks: What is "train oil," mentioned in your issue of Oct. 29 as part of a Swiss method of hardening tools? *A.*—Oil obtained from the blubber of whales by boiling.

(47) J. R. E., New Haven, Conn., writes: Can you give me a mixture for hard pattern metal for small castings? *A.*—White metal is frequently used, and many molders prefer cast-iron. We prefer to use hard rubber.

(48) J. S., Little Rock, Ark., writes: Please name some good publication on general blacksmithing and give the address of the publishers. *A.*—"Practical Blacksmithing," by M. T. Richardson, editor of the *Blacksmith and Wheelwright*, New York.

(49) T. E. C., ——, asks: Can you inform me of some dissolvent for common "half-and-half" solder that will not attack steel when present in the bath? *A.*—We do not know of anything that would answer this purpose. Perhaps some of our readers may know of something.

(50) H. H., Philadelphia, Pa., writes: I have charge of an engine with a cylinder 8 inches diameter; stroke, 10 inches; boiler pressure per gauge, 60 pounds; revolutions, 150 per minute. I use about 1 pint of cylinder oil per day, running from 7 A. M. to 6 P. M., without stopping at noon-time. Do you think that quantity is sufficient? *A.*—Yes; it is about the usual quantity used for this size of engine. 2 What would you estimate the horse-power of this engine to be? *A.*—About 11 horse-power.

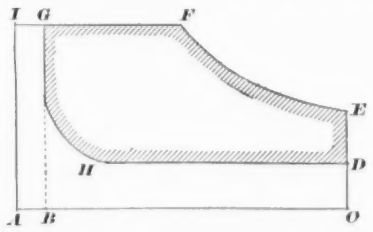
(51) M. B. R., Bay City, Mich., writes: We would like to get a little information from you in regard to figuring on the weight of marine boilers. When we do so, we figure all the plates, rivets, and all material it takes to make it. About what per cent. is taken away from that by punching holes, chipping, etc., to make the net weight when finished? *A.*—No rule can be given to compute the per cent. of iron lost in building boilers. Some forms of boilers require a greater number of sheets and involve a greater waste than other forms of boilers of the same weight. It will be evident that, as the number of plates increase for a given weight of boiler, the percentage of waste will also increase. Hence the loss will depend on the general design and construction of the boiler.

(52) W. F. W., Auburn, N. Y., writes: In most boilers, when under a good head of steam, the water rises in the glass, especially when the engine is started up. Now what I wish to know is, from where does the water rise? Does it rise from the bottom? Or does it swell or expand in bulk? Or is there a space between the water and steam at a point below the glass? It seems to me that there is a dangerous spot somewhere in such boilers. I have not found a man that knew where the water came from. *A.*—You can easily satisfy yourself on this point by trying a simple experiment. Take a glass tube closed at one end, or test tube, and fill about one-half of it with water, and hold it over a gas flame. As the water begins to boil, bubbles of vapor will rise to the surface of the water; these bubbles require space, and consequently raise the water level. This is exactly what occurs in a boiler when crowded; the steam bubbles formed at the bottom require space and raise the water level, and carry some of the water upwards.

(53) J. B. R., New Castle, N. B., writes: I am fitting up an old boiler; its shell is 16 feet long, 4 feet diameter; 109 two-inch tubes, 16 feet long; fire box, 4 feet 3 inches long, 3 feet 4 inches wide, and 4 feet 6 inches high; stay bolts through the sides of fire box, 4½ inches between centers; shell and fire box are made of ⅝ iron, with single-riveted girt seams and double-riveted longitudinal seams. Pipe for safety valve is 3 inches diameter; safety valve, 3½ inches diameter, with cross for stem of valve. 1. Is the safety valve large enough? *A.*—Yes; the seat should have an angle of inclination of 45 degrees to the center line of axis. 2. What pressure can I carry on this boiler? *A.*—If all the plates are sound, well stayed, and the rivets and their pitch in the seams properly proportioned, you may carry a pressure of 78 pounds per square inch. 3. What is the horse power of this boiler? *A.*—The horse-power of a boiler is a very indefinite term; but following the usual rating, by allowing 15 square feet of heating surface per horse-power, we should rate it at 60 horse-power.

(54) E. G. S., Columbia, Pa., asks: What is the proper mixture or composition generally used in hektographs? *A.*—The composition is made from the best gelatine and glycerine. One ounce of gelatine is soaked over night in cold water and in the morning the water is poured off, leaving the swelled gelatine. Six and one-half fluid ounces of glycerine are now heated to about 200 degrees Fah., on a water bath preferable, and the gelatine is added thereto. The heating is continued for several hours. This operates to expel the water and to give a clear glycerine solution of gelatine. The composition is then poured into a tray, which must be perfectly level in order to obtain a surface nearly even with the edge. It is then covered so as to keep off the dust. The cover, of course, must not come in contact with the smooth surface. In six hours it will be ready for use. The original copy that is to be reproduced is made upon ordinary paper in aniline ink. One formula for the ink reads as follows: Aniline violet or blue (2 R B or 3 B), 1 oz.; hot water, 7 fluid oz.; dissolve. After cooling, add alcohol, 1 fluid oz.; and glycerine, ¼ fluid oz.; a few drops of ether and a drop of carbolic acid. Keep in a corked bottle. The writing is executed with an ordinary steel pen. The lines should be rather heavy, so as to show a greenish color by reflected light. The surface of the pad is slightly moistened with a wet sponge, and is allowed to become nearly dry. The paper is then laid upon it and smoothed down. This is best done by placing a second sheet over it and rubbing this with the hand. No air bubbles must remain between the copy and the tablet, and the paper must not be shifted. It is allowed to remain for a minute or less and is then raised by one corner and stripped from the gelatine surface. It will have left the reverse copy of its inscription perfectly reproduced upon the tablet. At once a piece of ordinary writing paper of the desired size and quality is laid upon the tablet, smoothed down and stripped off, when it be found to have taken with it a complete copy of the inscription or writing; this is repeated over and over again with other sheets of paper, until the ink on the pad is exhausted. Fifty or more copies can be thus obtained. As soon as the work is completed, the remains of the ink should be washed off with a moist sponge, and the tablet, after drying a little, will be ready for a second operation. For other receipts of the compound for hektographs and different inks, see "Rubber Hand Stamps and the Manipulation of India Rubber," by T. O'Conor Sloane, from which book the above has been taken.

(55) W. E. P., New York, writes: I would like you to explain how to compute the horse-power of a non-condensing engine, and also of a condensing engine, when the boiler pressure, piston speed, the cut-off and the clearance are given. Also explain how to find the terminal pressure in the cylinder. I have books on the subject, but I do not understand it, and in some cases no account is taken of the clearance. I know of no other who can explain this to me, so I must fall back to the privilege of your paper. *A.*—



Let *D E F G H* represent an ideal card, *B C* the stroke of the engine, *G F* the distance from the beginning of the stroke to the point of cut-off, and *A B I G* the clearance in per cent. of the piston displacement; if this is 7 per cent., then *A B* will be 7 per cent. of the stroke *B C*. In making close computations of the horse-power of any engine, the absolute steam pressures should be taken; by absolute steam pressure is meant the pressure as indicated by the steam gauge plus the atmospheric pressure. The latter is usually taken at 14.7 pounds, but frequently, for convenience, it is taken at 15 pounds. To show how the horse-power of an engine can be found according to the conditions stated, we will take the following example: Diameter of cylinder, 18 inches; stroke, 24 inches; initial steam pressure by the gauge, 69 pounds; steam to be cut off at half stroke; clearance, 7 per cent.; number of revolutions per minute, 120; find the horse-power when the engine is working as a non-condensing, and also as a condensing engine. The absolute initial steam pressure in the cylinder is 69 + 15 = 84 pounds. The first step will be to find the ratio of expansion. If the clearance is not taken into account, then we would simply divide the length of stroke *B C* by distance *G F* up to the point of cut-off, and this would give us a quotient of 2 for the ratio of expansion. But we are to take the clearance into account; hence, to obtain the ratio of expansion under these conditions we must divide *A C* by *I F*. Now, the clearance is given at 7 per cent. of the piston displacement; therefore *A B* will be 7 per cent. of *B C*; but *B C* represents the stroke of 24 inches, consequently the length of *A B* will be $24 \times .07 = 1.68$ inches, and the distance from *A* to *C* will be $24 + 1.68 = 25.68$ inches. *I G* is equal to *A B*, and *G F* represents one-half of the stroke, because steam is cut off at half stroke, hence the distance from *I* to *F* will be $12 + 1.68 = 13.68$ inches; and the ratio of expansion will be $\frac{A\,C}{I\,F} = \frac{25.68}{13.68} = 1.87$. This result we can find in a simpler way. Let *B C* represent 1, then *A B* will be .07, *G F* will be .5, and *I G* .07. Let the ratio of expansion be denoted by *r*, then we have

$$r = \frac{1 + .07}{.5 + .07} = \frac{1.07}{.57} = 1.87,$$

as before. Our next step will be to find the mean absolute driving pressure throughout the stroke in pounds per square inch. To compute this, we must first find the hyperbolic logarithm of the number of expansions. This is easily found by referring to a table of hyperbolic logarithms, or by multiplying the common logarithm of the number by 2.302585, usually by 2.3. The ratio or number of expansions we have found to be 1.87; the hyperbolic logarithm of this number is .625. To compute the mean pressure, add 1 to .625, which gives us 1.625; multiply this by the absolute initial steam pressure, $1.625 \times 84 = 136.5$; divide this by the ratio of expansion $\frac{136.5}{1.87} = 72.99$, say 73 pounds for the mean absolute pressure from *A* to *C*. We have already shown that the length of *A C* may be taken as 1.07, and *A B* as .07. Now multiplying the mean pressure (73 pounds) by *A C*, and multiplying *A B* by the initial pressure (84 pounds), and subtracting the latter product from the former, we obtain the mean absolute driving pressure throughout the stroke *B C* per square inch. Thus:

$$(73 \times 1.07) - (84 \times .07) = 72.23$$

pounds for the mean absolute pressure throughout the stroke *B C*. This pressure is opposed by a mean back pressure; hence, subtracting the latter from the former, we obtain the mean effective pressure for performing work. For non condensing engines the back pressure ranges from 15 to 25 pounds absolute; for a mean value we may adopt 17 pounds; hence for the mean effective pressure when the engine is working non-condensing we have $72.23 - 17 = 55.23$ pounds. Now the horse-power is easily found by the familiar formula:

$$H = \frac{P \times L \times A \times N}{33{,}000} \qquad (1)$$

in which *H* denotes the horse-power, *P* the mean effective pressure in pounds per square inch of piston, *L* the length of stroke in feet, *A* the area of piston in square inches, *N* the number of strokes per minute, which is equal to twice the number of revolutions per minute. Substituting for the symbols in formula (1) their values, we have,

$$H = \frac{55.23 \times 2 \times 254.47 \times 240}{33{,}000}$$

which gives us 204.4 horse-power when the engine is working non-condensing. In condensing, the back pressure ranges from 2 to 5 pounds absolute; let us adopt the latter; then the mean effective pressure in this case will be $72.23 - 5 = 67.23$ pounds pressure for performing works. Applying formula (1) we have

$$H = \frac{67.23 \times 2 \times 254.47 \times 240}{33{,}000}$$

which gives 248.8 horse-power for a condensing engine. 2. To find the terminal pressure: Assuming Mariotte's law to be true for the expansion of steam, divide the length of *I F* by the length of *A C*, and multiply the quotient by the absolute initial steam pressure; the product will be absolute terminal pressure. In our example we know that $I\,F = .57$ and $A\,C = 1.07$, in which *B C* is assumed to represent 1. Hence we have $\frac{.57}{1.07} = .53$, and $84 \times .53 = 44.52$ pounds absolute; subtracting from this the atmospheric pressure, we have $44.52 - 15 = 29.52$ terminal gauge pressure. This holds true only when the exhaust valve opens at the end of the stroke.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Grant's new 1892 Gear Book. See page 20.

Link-Belting and Sprocket Wheels.

Send for Catalogue of Link-Belting.

Over 50,000,000 feet of Link Belt in use.

Link Belt Engineering Co., Philadelphia and N.Y

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. W. S. Rogers, Troy, N. Y

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

See Gage advertisement below.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Gage Tool Co.'s Self Setting Plane does more and better work in less time. On trial. Vineland, N. J.

The Improved Justice Hammer. Williams, White & Co., Moline, Ill., manufacturers.

For Foundrymen's Metallic Pattern Letters and Figures, send to Knight & Son, Seneca Falls, N. Y.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 South Canal Street, Chicago, Ill. agent for Holbrook's Raw Hide Blanks for Gears.

Our Automatic Gear Cutting Machine will increase production 50%. The Superior Mach. Wks., Clev'd, O.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

S. W. Card & Co., Mansfield, Mass., make everything in the line of Taps and Dies. S. A. Smith, 23 S. Canal St., Chicago, Western Agent.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

Save small iron from foundry refuse. It pays Use the Woodruff Pat. Separating Machine, Audubon Machine Works, New Haven, Conn.

"Roper's Hand-books for Engineers and Firemen." Descriptive Catalogue mailed free to any address. Edw. Meeks, Pub., 1012 Walnut St., Phila., Pa.

25" 32" 37" 42" — "Only Drill Press built on 'Ko-rekt' principles, Even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

Complete treatise on Screws and Screw-making, with clear and concise explanation of the methods; 95 illustrations. Price, $1.25 postpaid. E. & F. N Spon, 12 Cortlandt St., N. Y.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases.
31 Nassau street, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Railroad wrecks do not decrease to any appreciable extent. It seems more than ever probable that the general government will have to take strong grounds in the matter.

Early Steel.

The Chinese, who, in very early ages, had attained to some degree of understanding in the elementary principles of science and their applications, possessed also a comparatively advanced amount of knowledge in the manufacture and use of steel. Of its origin among them we have no account; but it is quite conceivable that its discovery preceded that of the lodestone, which, under the name of Tche chy (directing stone), was in use among them fully 2600 B. C. There is mention of steel in very ancient Chinese writings, and an account of the process of manufacture by one writer about 400 B. C., and various descriptive allusions to it, implying a considerable amount of knowledge and power of discrimination in reference to its properties, occur at various subsequent periods down to the present day, when it is still a flourishing branch of their manufacture.

Inferentially, it is perfectly clear that the Phœnicians were acquainted with the use of extremely hardened iron (properly speaking, steel), as their numerous and beautiful works in ornamental metallurgy, and the cutting and engraving of precious stones, for which they were conspicuously eminent among the nations of antiquity, necessarily involved, as also do the inscriptions which exist in the Phœnician language. Phœnicia

as represented by its famous daughter city of Tyre, was at the height of artistic celebrity in the time of David and Solomon (1050–1000 B. C.) With them, as powerful neighboring monarchs, Hiram, the ambitious young King of Tyre, found it wise to enter into a friendly alliance, and concluded an arrangement which proved to be for the mutual advantage of both communities, in the numerous works of art and value, especially in metallurgy, executed by his trained artificers for the furnishing and enrichment of the temple, capital, and palace at Jerusalem.—*Chambers' Journal.*

Wants to Reduce Wages.

A bill has been introduced in Congress to reduce the salaries of government officials. If the bill should become a law, the President's salary would be reduced by one-half, and other salaries exceeding $100 per month by from ten to twenty per cent.

There is probably no ground whatever for the statement that has, to some extent, gone out, that the foundations of the buildings for the Chicago Fair are insecure. Architects and engineers in Chicago know what is necessary in the instance of soil there, and they will put up the buildings to serve their purpose.

A "Big Four" switching engine, which was drawing a train of loaded coal cars to the works of the Warder, Bushnell & Glessner Company, at Springfield, Ohio, jumped the track, and ran for some distance over the frozen ground to a small house near the track. This house it partly demolished, the front of the engine being in the parlor when it stopped.

It is a good time just now to buy machine tools and machinery. While there is no occasion for saying that business is dull in these lines, it is a fact that prices are low, and there are good reasons for believing that prices will advance. Machinery of the best class could never be bought for so little money as to-day.

A Toronto (Ont.) dispatch says: Frederick W. Martin, electrician of the Toronto Electric Light Company, while passing between two large dynamos, completed the circuit between them, and was rendered unconscious, and possibly fatally injured by the shock. When he recovered consciousness it was found that he was blind.

The Tradesman, of Chattanooga, Tenn., has issued its "annual." It gives a vast amount of information concerning the industrial interests of the South, and will prove very useful to all who are interested in southern industrial development.

There is something in the way of a famine in Russia, owing to the failure of crops, and some millions of dollars, mostly in the way of flour, has gone there from this country. This is much better than exchanging shot and shell.

A Russian economist has calculated that while an English cotton spinner, working 10 hours a day, earns 70 roubles a month, the Russian cotton spinner, working 12 hours a day, only earns 19¼ roubles.

Congressman Cummings, of New York, has introduced a bill to empower the Secretary of the Navy to invest $1,250,000 in the construction of a sub-marine boat for harbor defense.

A correspondent would like to know of some metal that will stand the effect of cider vinegar without injury to the metal or the vinegar. Can any of our readers help him?

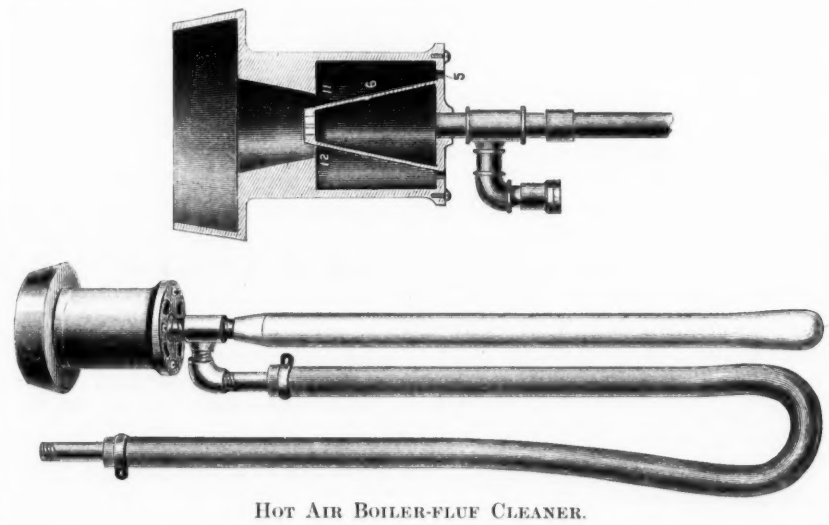
A proposition is now before Congress to provide for a channel twenty-one feet in depth from Lake Superior to the sea, through the Erie Canal.

We have little doubt that most of our readers are rejoicing that the war which has raged so fiercely with Chili (in some of our newspapers) is at last over, and has turned out to be a bloodless one. There is every reason, so far as we can see, why we should wish to avoid war, especially with a nation of about one-twentieth our size and strength. Aside from the other disagreeable features of wars, which those who have taken part in them fully understand, it is to be remembered that wars are frightfully expensive, and that the expense of them falls heaviest upon those who are least able to bear it; *i. e.*, the money taken from the pockets of the people to pay for campaigns is in the main taken from each in proportion to what he consumes, and not in proportion to what he has or to his ability to pay, and of one thing we may be sure, that those who carry on the useful work of the world, eventually, and in some way, are made to pay all such expenses.

Hot Air Boiler-flue Cleaner.

The accompanying engravings show the general appearance and also a sectional view of a new boiler-flue cleaner devised by a practical engineer and used by him experimentally until the best form and construction were arrived at.

The main feature of the cleaner is in the fact that it uses with the steam a current of hot air which is drawn in and heated before it emerges from the nozzle, the result being that the flues are cleaned dry, in which condition the soot and ashes are much more



HOT AIR BOILER-FLUE CLEANER.

thoroughly cleared out than where they are first wetted by condensed steam.

The steam is first taken into the cone (6) which is surrounded by a chamber into which air is drawn and partially confined until thoroughly heated. When starting to clean flues with this cleaner the steam is turned on and kept blowing continually until the job is finished, and when flues are examined, after being blown out, they are found to be clean and dry. The cap at the end is screwed onto the body of the tool, and can be removed and replaced by one of any desired size to fit any size of flue. The inventor who has charge of a large steam plant in this city finds that he can easily clean 156 tubes in two boilers in ten minutes, and that the work is done in a thoroughly satisfactory manner. It has also been used by others with entire success.

It is made by Thomas Burke, Steers' Mills, foot of 125th street, New York City.

An example of the economic fogginess that pervades many newspaper offices, as well as other places, is seen in an item which is going the rounds of the papers, to the effect that the negroes of Georgia have returned to them from the treasury of the State, in the single item of public schools, $178,000 more than they pay into it for all purposes. This information is founded upon the utterly fallacious notion that the men whose names are signed to the checks handed in to the various tax gatherers are the only ones who pay any taxes, and that those who simply consume taxed goods, live in taxed houses, and carry on the bulk of the world's work, pay no taxes at all. The Astor family owns a goodly portion of New York City, and the Astor checks in payment of taxes are very large ones. But do the Astors really pay these taxes, or do the men who make use of the property pay them? Any one capable of looking at all below the surface of things will at once see that the latter pay every cent of it.

The erroneous notion that those whose names do not appear upon the tax books pay no taxes, and are, therefore, not interested in municipal affairs, and need not concern themselves with how taxes are gathered or the money expended, has done, and is doing, incalculable harm, and we want our readers to understand that, in proportion as they carry on useful work, and consume things to the cost of which taxes have in any way contributed, just in that proportion they pay taxes, even if they never see an assessor or a tax collector.

Mad because Pusey got your fireman, are you? Did you have any mortgage on that fireman? Had you any claims upon him, pecuniary, moral, social? of gratitude or otherwise? Did you ever offer to raise his wages? Did you ever go and nurse him when he was laid up with pleurisy caught in your service? Did you let him have twenty dollars ahead of his pay that day when he wanted to keep his life insurance paid up and could not make it? Did you marry his sister or he marry yours? I don't see what reason you have had all this time in supposing that the fellow would stay with you as long as he has. Is Pusey himself under any obligations to you or to any of your "forbears"?

Now, when you get right down to it, I happen to know something about that case. Your fireman has long been wanting to leave you, but simply has not seen a good chance but once before. That time was at Pusey's, and he went there and offered himself; and what is more, offered to go at a dollar a week less than you were giving him; and that was four dollars less than Pusey gave his last man. Pusey knew that you were rushed, that good firemen were scarce, and that you were touchy, and refused to take the man. This time the man went there and told Pusey that he was going to leave anyhow, because he never saw any chance for getting anything more out of you than a little more work and responsibility. And now you are going about—at least I suppose you are—saying that Pusey stole your man.

You owe some one an apology.—*Power and Transmission.*

MANUFACTURES.

Zelienople, Pa., is to have a foundry and machine plant.

It is stated that a wire-mill will be erected at Jersey City, N J.

Machine shops will probably be established at Greenville, Tenn.

A foundry is to be established in the vicinity of Stewartstown, Pa.

Kenosha, Wis, hopes to secure the location of an eastern iron plant.

New machinery is to be put in the Huguenot Cotton-mills, Greenville, S. C.

C. L. Wilson may erect a plant for grinding phosphate rock, at Homeland, Fla.

New machinery is to be placed in Benson's flouring-mill at Washington Grove, Md.

There is a possibility of an electric light plant being established at Geneseo, N. Y.

The Wright Machine Company, of Worcester, Mass., will erect a building at that city.

The Lewis Foundry and Machine Company, of Chicago, is adding a foundry department.

It is said that large railroad shops will be built by the New York Central at Buffalo, N. Y.

The Glenwood & Green Lawn Street Railway will erect a power plant at Columbus, Ohio.

It is said that the Lake Erie and Western road will soon place orders for ten new locomotives.

A newly organized company will establish the manufacture of chemical engines at Belding, Ohio.

Gainesville parties will probably establish an iron foundry and machine shop in Velasco, Texas.

The steel works at Lickdale, Pa., will double their capacity, and turn out 150 tons per day next month.

The Mendelssohn & Co. Woolen-mill, at Newburgh, N. Y., is to be rebuilt, it is said, at a cost of $160,000.

An increase of $35,000 is to be made in the capital stock of the Chicago (Ill.) Ornamental Iron Company.

W. D Snow has perfected arrangements for the manufacture of his wood force pumps, at Birmingham Ala.

It is understood that the manufacture of vises is to be established in the old match factory at West Troy.

The White Sewing Machine Company, Cleveland, O., will, it is said, build a factory, 82x100 feet, to cost $17,000.

Dooley, Ivy & Co., a new firm, will manufacture all kinds of brasses for engines, cars, etc., at Atlanta, Ga.

D. A. Childs has, it is stated, put new machinery in, and greatly enlarged his plating works at Columbia, S. C.

At New Brunswick, N. J., the Gyre Centrifugal Machine Company has been incorporated, with a capital of $22,000.

The W. & B. Douglas Pump Shops, at Middletown, Conn., which were shut down for repairs, have been started up.

A machine shop has been erected by the Snyder-Romans Co., of Helena, Ark., and a new planing-mill will also be built.

It is said that the Lima Machine Works, of Lima, O., is considering the removal of its machine works to Chattanooga, Tenn.

G. H. Allen is to replace his box factory, recently burned at Beverly, with a new one, 100x60 feet, and boiler house, 34x31 feet.

Report says that the Taylor (Texas) Ice Company will put in, at a cost of $14,500, an entire new outfit of machinery.

Contracts have been let for the additions to the machine shops of the Norfolk & Western Railroad Company, at Bluefield, W. Va.

Albert Smith, of New York, is investigating with a view of establishing an electric light plant and ice factory in Brenham, Texas.

J. and D. Noble have purchased and will put in operation the Murray & Stevenson foundry and machine shop at Anniston, Ala.

The South Bound Railroad Company (office, Savannah, Ga.,) has, it is stated, decided to erect machine shops at Graham, S. C.

There is a well founded rumor that a new brass works will shortly locate in South Newmarket, N. H., to employ about fifty hands.

The Moffett Journal Bearing Company, of Chicago, has filed a certificate of increase of capital stock from $100,000 to $1,000,000.

Hugh Jones will erect a machine shop and warehouse on Evans street, at St. Louis, Mo., to be of brick, one story high, 48x60 feet.

The new Raney & Berger furnace, at New Castle, Pa., is about completed, but will probably not be blown in for some time to come.

D. S. McCullough has purchased the Shelbyville Foundry and Machine Shop, at Shelbyville, Tenn., and will greatly increase its capacity.

It is said the Pioneer Mining and Manufacturing Company, of Thomas, Ala., will erect another iron furnace in addition to its present plant.

The Phelps Manufacturing Company has been incorporated, at San Francisco, Cal., with a capital of $300,000, to manufacture iron, steel, etc.

The Port Townsend Steel Wire and Wire Nail Company has been incorporated, at Port Townsend, Wash., with a capital stock of $100,000.

The Newark (O.) Paper Co. is making extensive improvements to its mill. An addition, 50x30 feet, is being built, and new machinery is to be put in.

Park Bros. & Co., Limited, of Pittsburgh, Pa., will increase the capacity of its Black Diamond Steel Works by the erection of two new mills.

J. H. Cole, of Parkersburg, W. Va., is investigating with a view of removing his iron foundry, machine shop and boiler works to Bridgeport, Ala.

E. C. Wearfritz (Little Rock, Ark.,) has organized a stock company for the erection of a plant for the manufacture of engines, boilers, etc., at that point.

A $10,000 stock company has been organized, to erect an electric light plant at Elizabeth City, N. C. George M. Scott can be addressed for information.

The Northington-Munger-Pratt Co. has been incorporated, at Birmingham, Ala., to manufacture patent cotton gins, etc. The capital stock is $150,000.

The Manhattan Type Foundry, of Fort Lee, N. J., has been incorporated, with a capital of $50,000, to manufacture type, printing presses, machinery.

The Junction Iron Company, and Laughlin and Junction Steel Company, both located at Mingo Junction, Ohio, have decided to erect an electric light plant.

M. R. Bacon, T. J. and J. I. Adams and C. E. Hyde have incorporated the Adams Hardware Company, with a capital stock of $50,000, at Jacksonville, Fla.

The Pioneer Tin-plate Company, of Joliet, Ill., has been organized, with a capital of $125,000, to manufacture sheet-iron, and tin terne, and galvanized sheets.

It is currently reported that Springfield (Mass.) parties are negotiating for the purchase of the plant of the defunct Livingston Cycle Company, at Westboro, Mass.

The Whittier Machine Company will build a machine shop, 140x82 feet, at Granite and First streets, Boston. The building will be of brick, with monitor roof.

It is said that the Bessemer Rolling-mill, at Birmingham, Ala., which was recently sold by a decree of court to Morris Adler and others, is soon to recommence work.

B. F. Sherrel, B. C. Epperson and others have incorporated the Lascasto Patent Handcar and Velocipede Company, at Jefferson, Texas, with a capital stock of $30,000.

It is possible that a palace car manufactory, now located in Massachusetts, will establish a plant at East Providence, R. I. The company is capitalized at $1,000,000.

In a recent issue, the types made us say that the Whipple & Armstrong Machine Co. would establish themselves at Harriman, *Pa.* It should have read Harriman, Tenn.

The new East St. Louis plant of the Missouri Malleable Iron Company is to be ready for occupancy April 1. The St. Louis plant is for sale, with or without machinery.

The Lake Shore engineers have completed plans for new yards and roundhouse at West Seneca, N. Y., near Buffalo, and a small repair shop will probably be built there.

The Southern Iron and Wire Works has decided to remove its plant to Denison, Texas, and is now making preparations to that end; will operate as the Denison Iron and Wire Works.

M. V. Smith, of Pittsburgh, Pa., proposes the erection and operation of a fuel gas plant at Wheeling, W. Va., provided the plant is taken off his hands, if its operation proves successful.

The Chaplin-Fulton Manufacturing Company, of Pittsburgh, Pa., has been incorporated by L. Fulton, Wm. Ralston and others, with a capital of $60,000, for the manufacture of iron and steel.

J. H. Ahern is reported as having purchased a controlling interest in the Florida Electric Company's electric light plant (Tampa, Fla.,) and as to improve, increase capacity of, and operate same.

Ridgeway, Elk Co., Pa., is to have a new industry. The J. H. McEwen Manufacturing Company, with a capital of $100,000, has been organized, for the purpose of manufacturing iron and steel in all shapes.

The Texas & Louisiana Equipment Company, of Chicago, has been formed, to deal in railway equipments; capital stock, $100,000; incorporators, Monroe L. Willard, Lockwood Honore and Eugene H. Dupee.

It is said that a number of capitalists have agreed to take $35,000 into New Lisbon, O., and build a rolling-mill which will employ 150 men, providing that town lends them $15,000 for five years without interest.

A $200,000 bridge is to be constructed across Red River, at Shreveport, La., by the St. Louis, Arkansas & Texas Railroad. Work will be commenced in a few months. The bridge will be about 1,000 feet in length.

The Mason Air brake and Signal Company, of Chicago, has been formed, for the manufacture of railway appliances. Capital stock is $1,000,000. J. R. and H. R. Mason and J. W. Dyrenforth are the incorporators.

A plant for the manufacture of Wheelock engines will shortly be erected by the California Engineering Company, who are now looking for a suitable site. The company have a capital stock of $600,000, and, it is said, will build on a large scale.

The Waterbury (Conn.) Brass Company, who were burned out last week, intend to start as soon as possible what is known as the East Brass-mill, just off the Cheshire road, a little beyond Melchizedeck Cemetery.

The Tyler Tube and Pipe Company, of Washington, Pa., manufacturer of boiler tubes, manufactures all its own iron, and is about to add another train of rolls to the rolling-mill, which will double its present capacity.

The Caldwell & Peterson Manufacturing Company, of Wheeling, W. Va., has shut down its plant for repairs. The repairs consist in the addition of another story, and some considerable changing of the interior arrangements.

It is said that the affairs of the Goshen Boiler and Iron Works, at Goshen, Ind., which have been in the hands of a receiver for some time, are in a fair way to being straightened out, and the works operated with a full force.

The Grandview Traction Company, of Pittsburgh, Pa., has been incorporated, with a capital of $15,000. The purpose of the company is the construction and operation of motors, cables, etc., for supplying power to railways.

The Chicago Central Construction Company, of Chicago, has been formed, to construct and equip elevated street car lines in Chicago; capital stock, $500,000; incorporators, Judson G. Sherman, Arthur Cox, and Robert S. Hill.

The Cumberland Ice Manufacturing Company has been organized by George Schwarzenbach (president). Lloyd Lowndes, A. D. Laden and others, for the manufacture of ice at Cumberland, Md. The capital stock is $30,000.

A charter has been issued to the Ramona Iron and Steel Company, of Bellevernon, Pa., with a capital stock of $60,000. The directors are F. Z. Shallenberger, of Pittsburgh; Jas. W. White, S. M. Graham, of Bellevernon, and others.

The North Carolina Smelting Company, of New Jersey, has been incorporated recently, with a capital stock of $1,000,000, and purchased the works of the North Carolina Smelting Company, of North Carolina, at Thomasville, N. C.

The Belknap Motor Company, of Portland, Me., are about to go into the manufacture of electric motors and dynamos and cyclone coffee mills on a larger scale, and they are now negotiating the purchase of the Giant E'ectric Motor Company's plant.

The American Radiator Company, of Detroit, Mich., has been organized, with a capital of $8,400,000. The company includes the Pierce Steam Heating Company, of Buffalo, N. Y., the Michigan Radiator Company and the Detroit Radiator Works, of Detroit.

There is water-works agitation in Auburn, Me.; Troy, N. Y.; Carlisle, Pa.; Altoona, Pa.; Lake Forest, Ill.; Ludington, Mich.; Battle Creek, Mich; Centerville, Tenn.; Salineville, Ohio; Phillipsburg, Mont.; Homestead, Pa; Paterson, N. J.; Randolph, Mass.; Argenta, Ark.; Cookston, Minn.

The Standard Engineering Company, of East St. Louis, has filed articles of incorporation. The company proposes to erect water-works and complete steam plants, also to manufacture and sell engineering supplies; capital, $250,000. Incorporators: Philip Ross, George W. Caudle and Henry C. Withers.

The Florida Car and Manufacturing Company has been incorporated, at Tallahassee, Fla., with a capital of $150,000. The principal office will be at Jacksonville, Fla. The company will manufacture cars, railway equipment, etc.; also make carriages and wagons, and do a general wood and iron work business.

The erection of the new tin plate factory of the N. & G. Taylor Company, at Philadelphia, will be started at the earliest moment, the firm say, and will be carried through to completion. While this will be a very large plant, capable of producing a great quantity of tin-plate, it is the intention to make only the best grades.

At the recent annual meeting of the Fort Scott Foundry and Machine Works Company, of Fort Scott, Kan., the name of the company was changed to that of the Walburn-Swenson Manufacturing Company, and the business will hereafter be conducted under that name. The capital stock of the company has been increased to $300,000.

The removal of the large foundry of the Pierce Manufacturing Company, which is located at Geneva, N. Y., to Syracuse, N. Y., is talked of. The company are negotiating now to erect and equip the largest foundry and machine shop in Syracuse, for the manufacture of their Florida steam and hot-water heaters and other articles. The concern employs 130 men.

A tin-plate mill is to be established at New Castle, Pa. Application has been made for a charter, the capital stock being placed at $150,000. The mill, when completed, will employ 150 hands. The incorporators are: John Stevenson, W. S. Foltz, J. P. H. Cunningham, M. S. Marquis, John Fahline, Frederick Lehberger, and George Freer, of New Castle, and S. W. Cunningham, of Pittsburgh, with others.

The following directors of the Troy (N. Y.) Laundry Machine Company (Limited) have been elected: T. S. Wiles, Albany; J. H. Ten Eyck, Albany; M. E. Wendell, Troy; Walter Bound, New York; Allen Conkling, Chicago; George F. Dodge, New York; H. S. Wilcox, Troy. The officers elected were the following: President, T. S. Wiles; vice-president, M. E. Wendell; secretary, J. H. Ten Eyck; treasurer and general manager, Allen Conkling.

The articles of incorporation of the Walter A. Wood Harvester Company, of Minnesota, have been filed at St. Paul, thus completing the organization of the company. Two million five hundred thousand dollars in 25,000 shares of $100 each represents the capital stock of the company. The entire business will be located in St. Paul, and will consist of factories, shops and general offices. The company will manufacture agricultural implements to supply the trade of the West and Northwest. P. S. MacGowan, of Hoosick Falls, will be general manager, with his office at St. Paul. The following are the directors: C. E. Dudley Tibbits, Walter P. Warren, J. Russell Parsons, William R. Merriam, Greenleaf Clark, James J. Hill, William Lindeke and Clinton Morrison.

The Malleable Iron and Steel Casting Company has been organized, at Baltimore, Md., with P. Kennedy as president and Thomas Flynn, vice-president and secretary, to make iron and steel castings. Site has been purchased and two buildings will be erected, one 50x100 feet, for the foundry, containing the cupola and furnace and fifty iron benches for molders; the other for the pattern and engine room, etc. Also to be erected are a number of annealing furnaces.

Machinists' Supplies and Iron.

NEW YORK, February 5, 1892.

Iron—American Pig—Quotations are somewhat higher, but there is not much new business in sight. We quote Standard Northern brands, No. 1 Foundry, at $17 to $17.50; No. 2, $15.75 to $16.50; Grey Forge, $14 to $14.50. Southern brands of good quality are obtainable at $16 to $17 for No. 1 Foundry; $15.50 to $16 for No. 2; $13.75 to $14 for Grey Forge.

Scotch Pig—Coltness is quoted at $22; Eglington $20.25.

Antimony—There have been some large sales reported at 11¾c. to 11½c. for Hallett's.

We quote Hallett's, 11½c. to 11¾c.; L. X., 12¾c.; Cookson's, 14½c. to 15c.

Copper—There has been no change of importance, and Lake is still being sold for prompt delivery at 10.07c. to 10¾c.

Lead—The demand is not active, and there are evidences of weakness, though prices are so far maintained. Values are nominal at 4.10c. to 4.15c.

Lard Oil—The market is somewhat higher, Prime City being held at 56c., and Western on spot at 55c.

Spelter—Not much business is being done, and prices are nominal at 4.60c. to 4.65c. on spot.

Tin—The market is weaker and quite dull. Spot values are about 19.6c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Three exp'd mech. draftsmen at once. Address Ch. Geo. D. Dutton, Springfield, Mass.

Wanted—Position by a 1st-class pattern maker and millwright; understands drafting. S. J., AM. MACH.

Experienced draftsman wants position; terms moderate. Box 49, AMERICAN MACHINIST.

Wanted—Position by mechanical draftsman; New York or B'klyn; references. F. D., AM. MACHINIST.

Wanted—Position by a man having 7 y'rs exp. as foreman in both pattern and machine shop, and 2 y'rs as gen'l manager; best refs. Box 48, AM. MACH.

Wanted—Position as traveling salesman by practical machinist, American; 2 years on the road; engines or other machinery pref'd. Box 43, AM. MACH.

Wanted—Position in drawing-room, by young pattern maker with experience in drafting. Box 46, AMERICAN MACHINIST.

Wanted—Several first-class machinists; vise and lathe men preferred; can find steady employment at good wages. Ottumwa Iron W'ks, Ottumwa, Ia.

First-class foreman pattern maker desires position as foreman; A No. 1 ref.; quick workman; age, 35; salary, $100 per month. Box 47. AM. MACHINIST.

Wanted—Position as foreman in marine or stationary shop, by an experienced man; can work men to advantage and furnish first-class references. Address H. M. C., 957 20th, Erie Pa.

Situation wanted, by a technical graduate of 29; has successfully held positions as foreman machinist, chief draftsman, and superintendent of a general machine works; competent to conduct duty trials of steam plants, design and erect general machinery. H. L., care AMERICAN MACHINIST.

Wanted—A machine shop foreman who is thoroughly familiar with the latest and best practice in manufacturing Duplex steam pumps; must be progressive and pushing; state other experience, age, married or single, and wages expected and references. Address Box 126, Seattle, Wash.

Wanted—Foreman of a department, thoroughly skilled in a good and cheap system of making Corliss engines and mining machinery; also salesman (who must be an engineer, a mechanic) to solicit business in the Southwest, who has had experience with hoisting steam and electric engines, rock drills, air compressors, etc.; applicant to state whose make of machinery he is most familiar with, his education, habits, experience and success in selling, acquaintance in different localities, and any other fact that will tend to show that he is a natural salesman, who can get fair prices for meritorious articles. Applicant can enclose his name in a separate sealed envelope, which will not be opened unless the answer is somewhat satisfactory to advertiser. Address Corliss, AM. MACHINIST.

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REPUTATION.
Men test everything in this world by what it produces.
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BRANCHES IN NEW YORK AND BOSTON.

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SMOOTH · COLD DRAWN
John S. Leng's Son & Co. New York.

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Emery Grinding, Polishing and Buffing Machines.
Bearings yielding or rigid at will.
Wheels *always true and in balance*, dispensing with use of diamond tool and chilled burr, and saving the time, labor, and cutting away of wheels, *otherwise wasted in truing*. Send for Catalogue.
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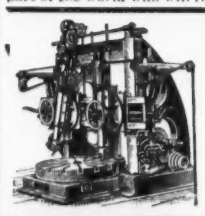

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FOR LAGGING LOCOMOTIVE BOILERS.
Samples and Descriptive Price List Free by Mail.

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87 Maiden Lane, NEW YORK.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 25 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded

Cheap 2d hd-lathes & planers. S. M. York, Clev'd,O.

Best Steel Flue Scrapers. Kelley Co , Erie, Pa.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Agent wanted in every shop; money in it. Scientific Machinist, Cleveland, Ohio. Sample copies free.

Wanted—Specialties to build. Mediapolis Iron Works, Mediapolis, Iowa.

Cheap—Two H. P. Engine Blue Prints complete. Designed to be built on an ordinary lathe. W. A. Smith & Co., 24 Custom House St., Providence, R. I.

Wanted, Agency—By an exp'd mech. eng., having large acquaintance with rolling-mills, railroads, machine shops, etc. Address Fred. Hoeppner. 95 Westinghouse Building, Pittsburgh, Pa.

Bound volumes for 1891. We are now prepared to take orders. Price, $4.00 per volume; express charges payable by purchaser. Address AMERICAN MACHINIST, 96 Fulton street, New York.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.

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AT A VERY LOW FIGURE.

1 Backgeared Screw Cutting Reed Lathe, 8 ft. 4 in. long, 18 in. swing.
3 backgeared Screw Cutting Reed Lathes, 6 ft. 2 in. long, 16 in. swing.
7 Backgeared Screw Cutting Reed Lathes, 6 ft. 4 in. long, 14 in. swing.
Above Lathes, latest improved cross-feed.
1 Universal Milling Machine, Brown & Sharpe, with complete attachments, cutters and spindles.
1 Pratt & Whitney Monitor Screw Machine.
1 Lathe, 6 ft. long, 12 in. swing, Prentice.
1 No. 2—4 Spindle Drill Press, Garvin.
1 No. 4—4 " " " "
1 Speed Lathe, 4 ft. long, 13 in. swing, Compound Rest.
1 Lathe, " " " "
1 Lathe, 3 ft. 6 in. long, 10 in. swing, Reed.
1 Shaping Machine, 16 in., Prentice.
1 Small Monitor Lathe, 3 ft. 6 in. long.
1 Power Punch Press, No. 94, E. W. Bliss.
1 Shaping Machine, 24 in. stroke, Hendey.
1 Small Universal Grinding Machine.
1 3-Spindle Drill Press, Sigourney & Co.
1 Power Press No. 2, Styles & Parker.
1 Small Lathe, 4 ft. long, 9 in. swing, Young & Co., Geared for Screw Cutting.
1 Small Universal Tool Grinder.
1 No. 1 Diamond Emery Wheel.
1 No. 2 Tool Grinder, Springfield Emery Wheel Mfg. Co.
1 Sturtevant Forge.
2 Single Spindle Drill Presses, Reed.

SECOND-HAND BELTING GOOD AS NEW.

Also an assortment of Iron Split Pulleys, Lathe and Drill Chucks of all sizes, and other small tools, such as Drills, Reamers, etc.

The above being a complete assortment of machinists' tools bought and intended to be used by the Niagara Metre Co., now dissolved.

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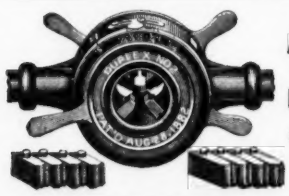

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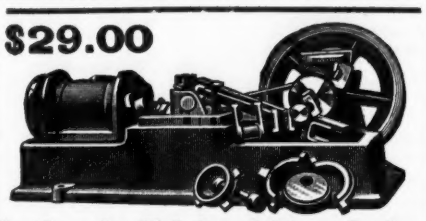

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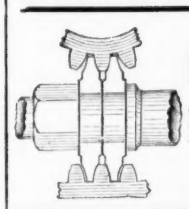
Sets of Castings for Engine illustrated above, with *Cast steel Shaft, Connecting Rod* and *Rock Shaft* and *Brass Bearings*, boxed and shipped on receipt of $29.00. Three sheet *blue prints* of working drawings extra.



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Reduction in prices to clear out my stock on hand. Now is the time to buy, as they will soon be gone. All sizes from 3 to 48 Pitch. Address

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ENGINE LATHES:—13 in.x6 ft.; 14 in.x6 ft.; 15 in.x 6 ft.; 16 in.x6 ft.; 18 in.x6 ft.; 18 in.x7 ft.; 18 in.x8 ft.; 20 in.x7½ ft.; 20 in.x8 ft.; 21 in.x8 ft.; 21 in.x10 ft.; 24 in.x20 ft.; 28 in.x12 ft.; 28 in.x16 ft.; 32 in.x 14 ft.; 32 in.x16 ft.; 34 in.x18 ft.; 33 in.x12 ft.; 33 in.x30 ft.; 38 in x16 ft.; 50 in.x22 ft.; 72 in.x17 ft.; 84 in.x 16 ft.; Gap Engine Lathe 24 in. swing over bed, 48 in. swing in gap, 26 ft. bed, with raising block, to make 36 in. swing over bed, and 60 in. swing in gap. Gap Engine Lathe 19 in. swing over bed, 35 in. swing in gap, 15 ft. bed.

IRON PLANERS:—24 in.x24 in.x4 ft.; 24 in.x24 in.x5 ft.; 24 in.x24 in.x6 ft.; 26 in.x24 in.x5 ft.; 28 in.x28 in.x6 ft.; 28 in.x28 in.x8 ft.; 30 in.x30 in.x7 ft.; 30 in.x30 in.x8 ft.; 32 in.x32 in.x10 ft.; 36 in.x36 in.x10 ft.; 54 in.x42 in. x24½ ft., two heads; 62 in.x42 in.x 6 ft.

UPRIGHT DRILLS:—20 in. swing, 26 in. swing, 28 in. swing, 30 in. swing, 36 in. swing.

SHAPING MACHINES:—9 in stroke, 11 in. stroke, 12 in. stroke, 16 in. stroke.

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1 No. 3 Brainard Milling Machine, back geared.
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2 Bolt Cutting Machines to cut to 1 1-4 in.
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HORIZONTAL ENGINES:—6 in.x9 in.; 6 in.x10 in.; 14 in.x30 in., Corliss.

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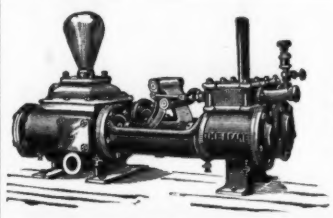

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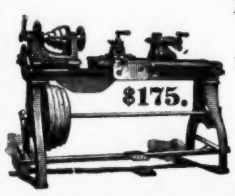

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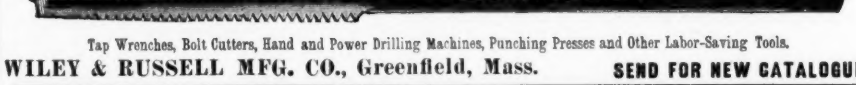

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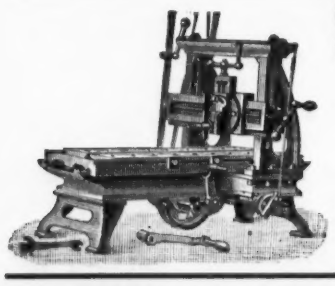

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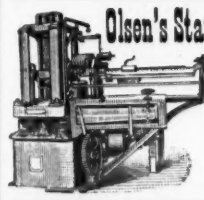

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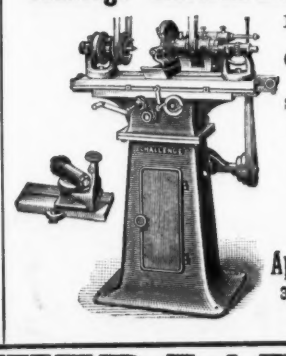

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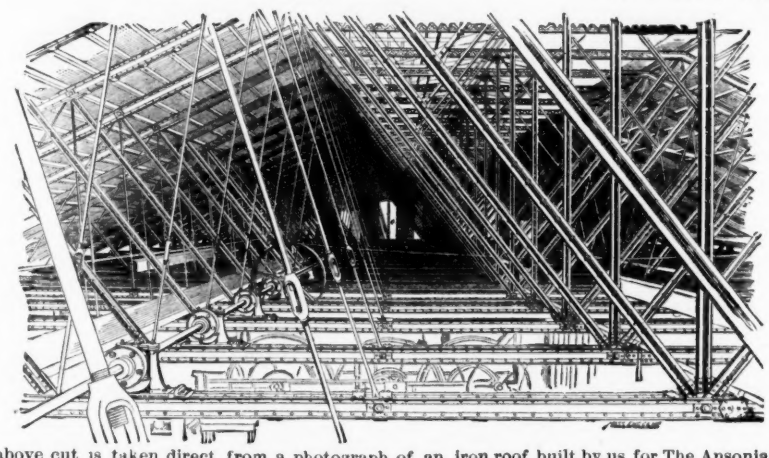

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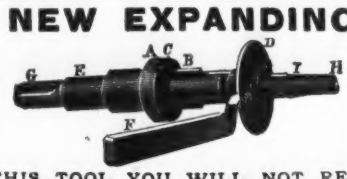

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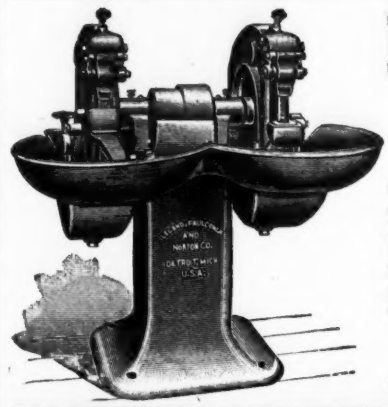

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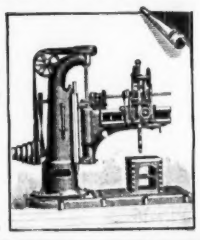

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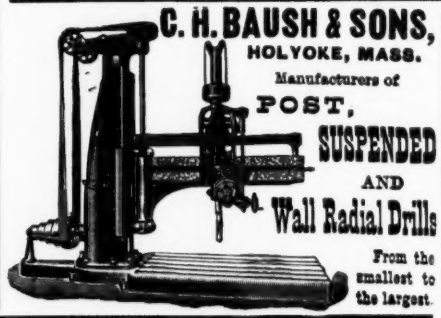

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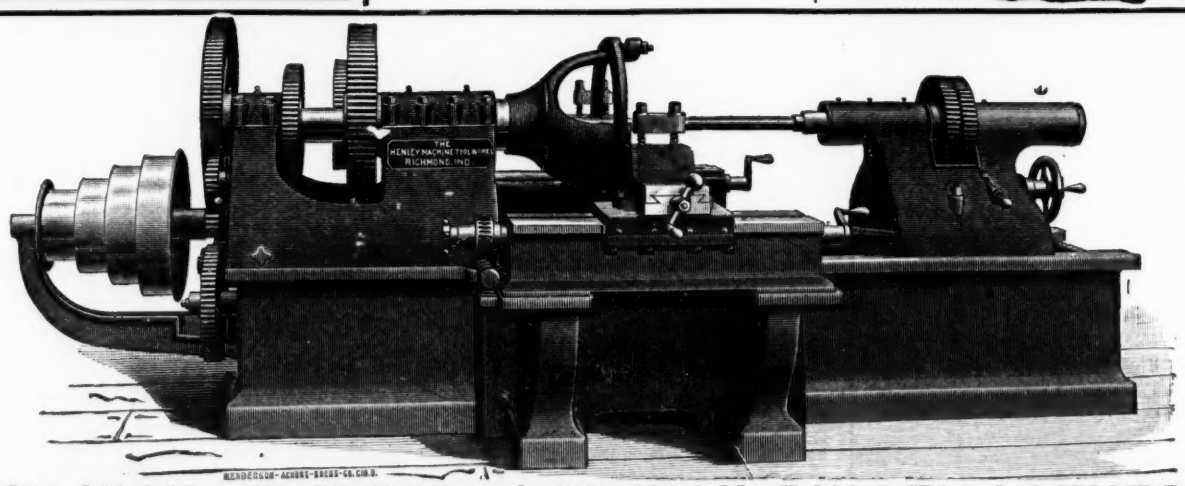

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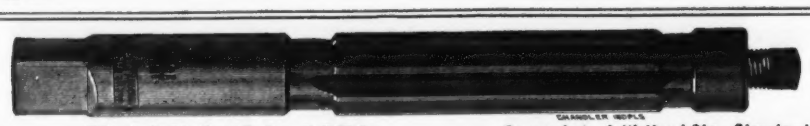

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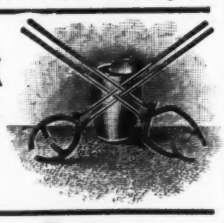

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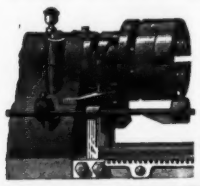

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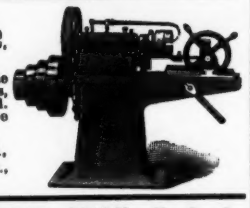

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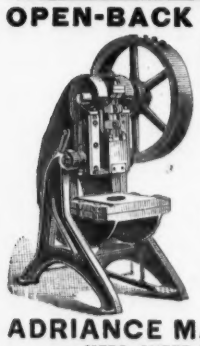

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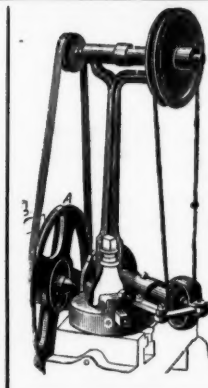

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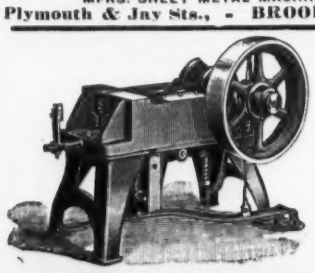

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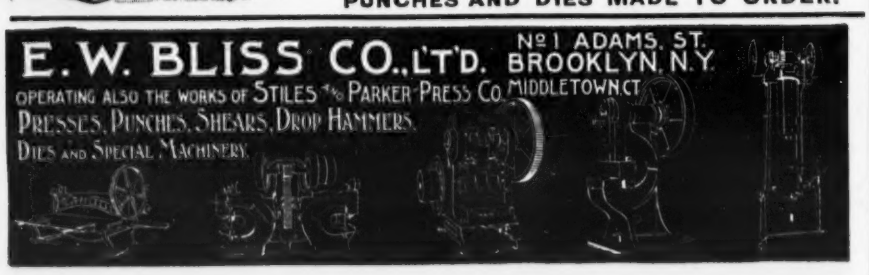

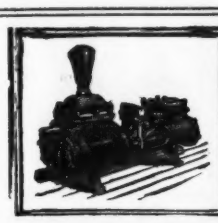

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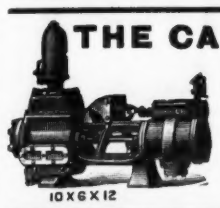

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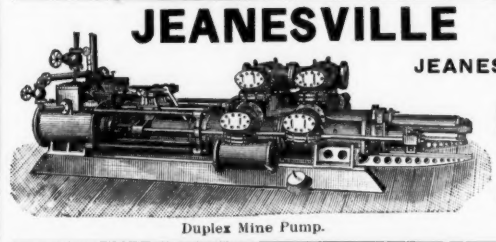

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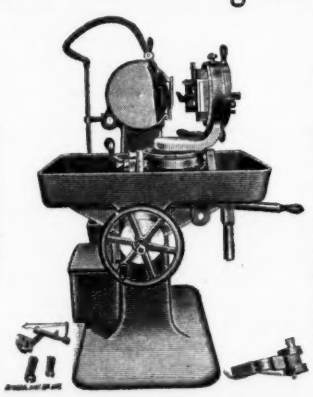

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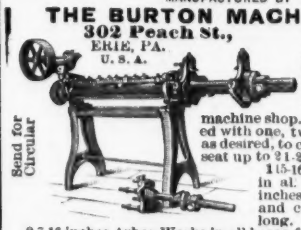

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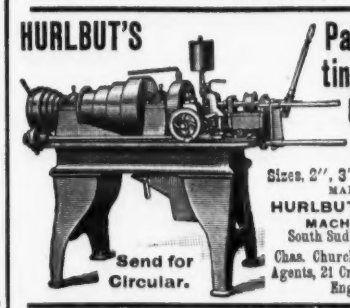

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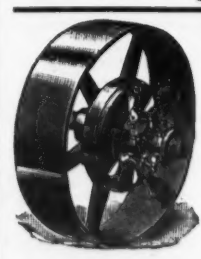

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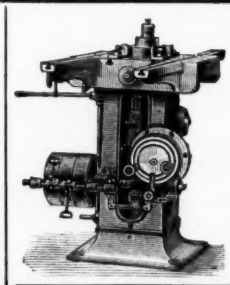

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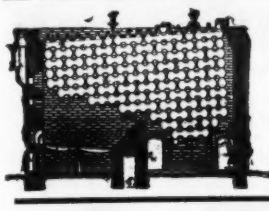

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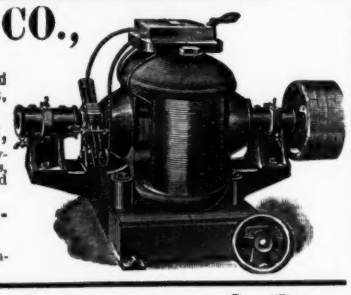

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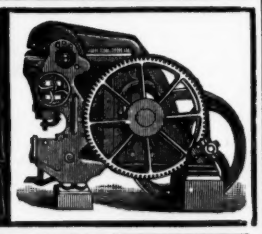

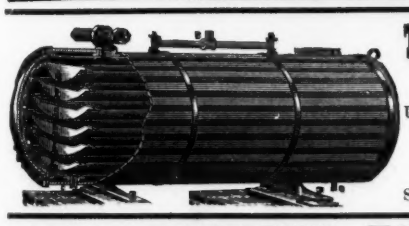

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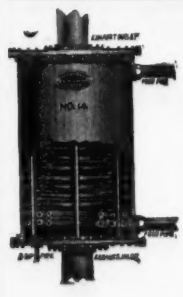

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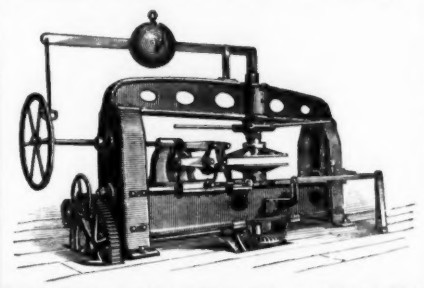

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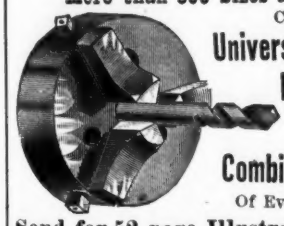

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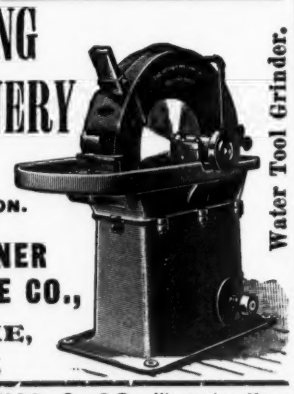

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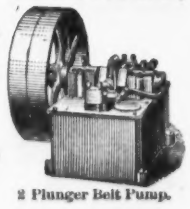

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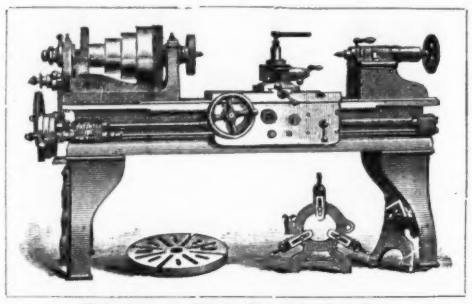

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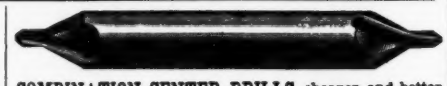

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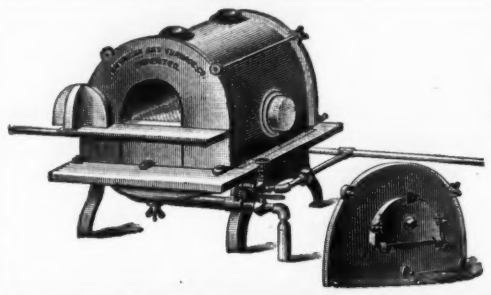

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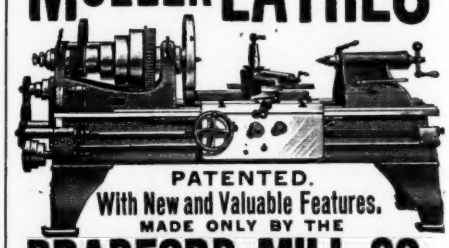

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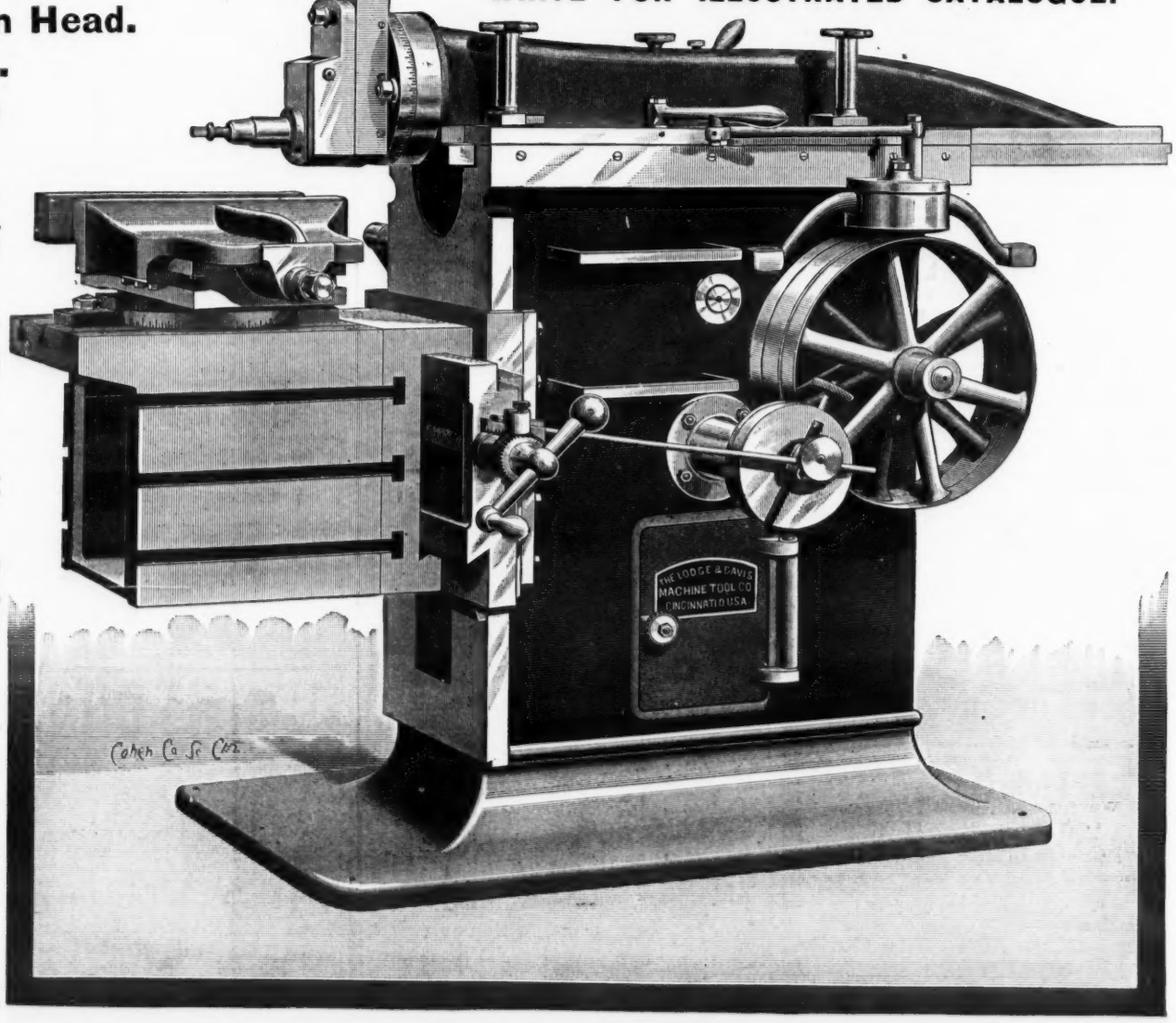

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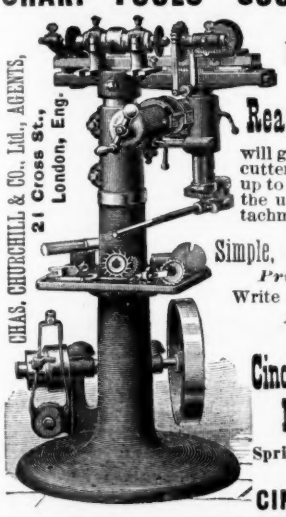

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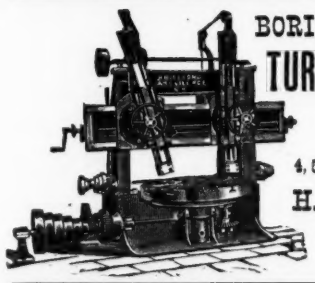

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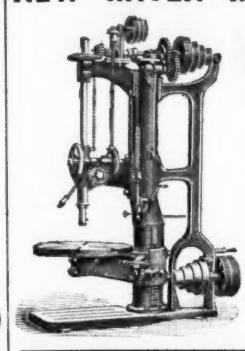

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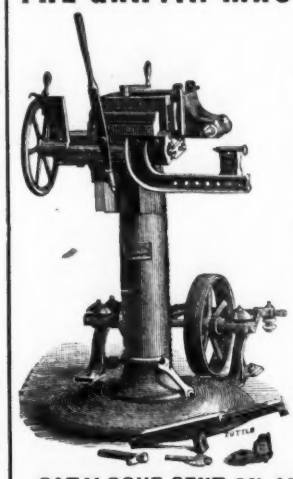

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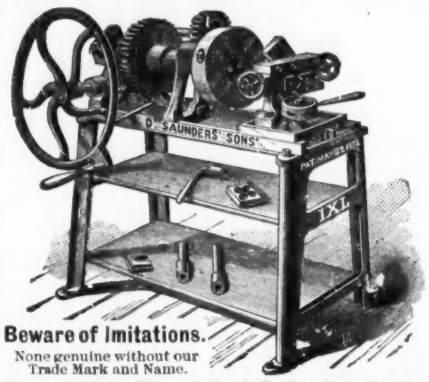

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Substantial, Well Made, Low Price, Patented,
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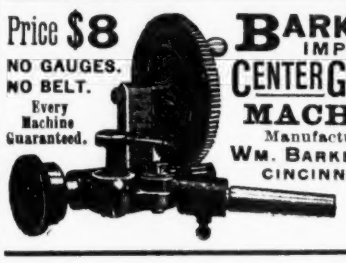

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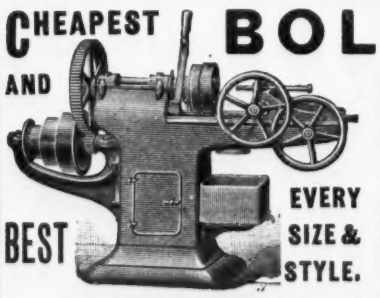

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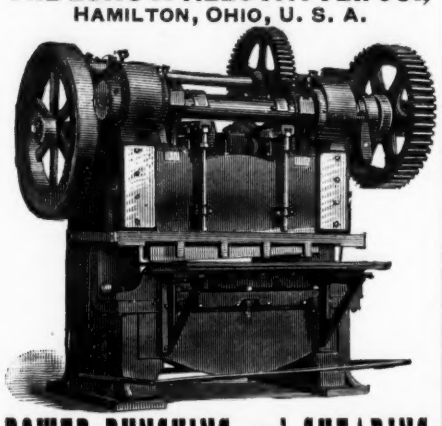
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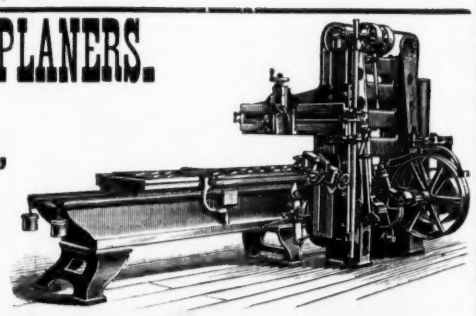
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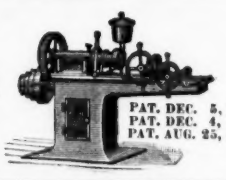
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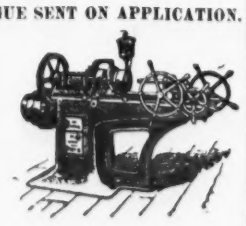

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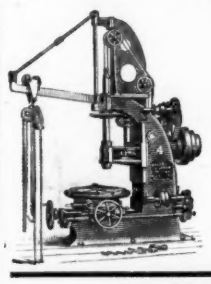

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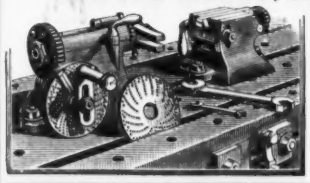
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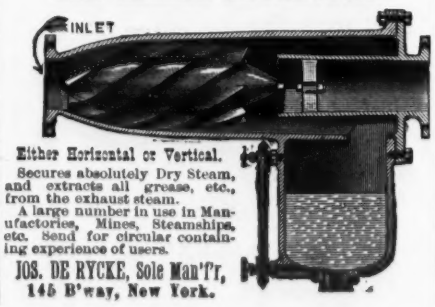

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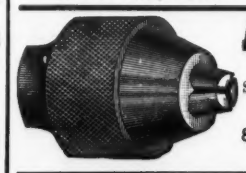
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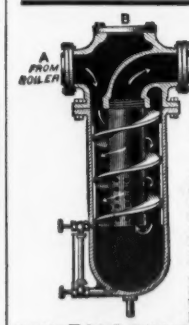

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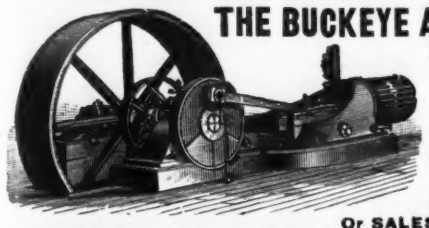

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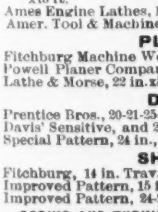

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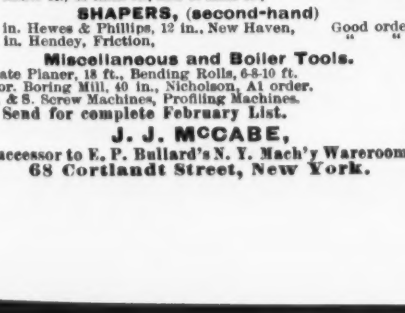

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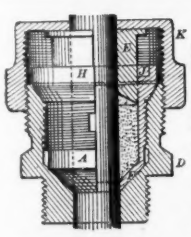

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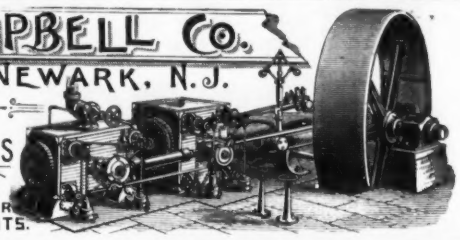

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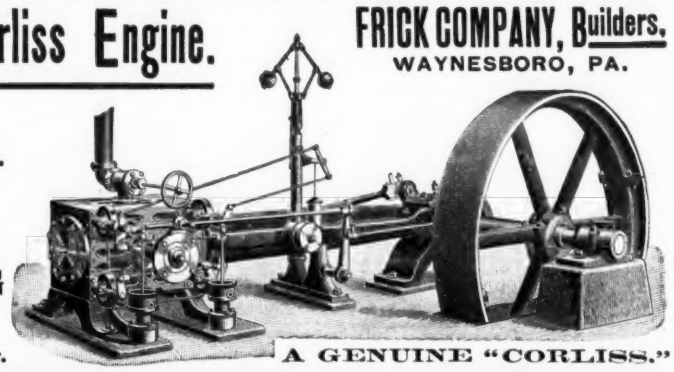

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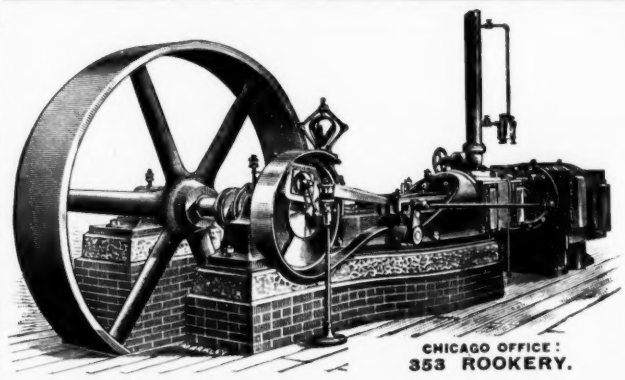

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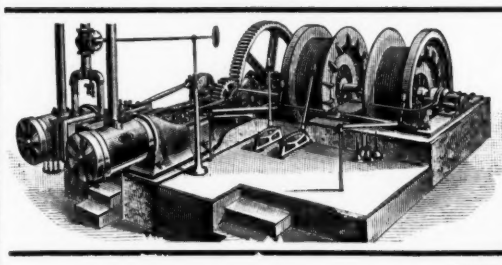

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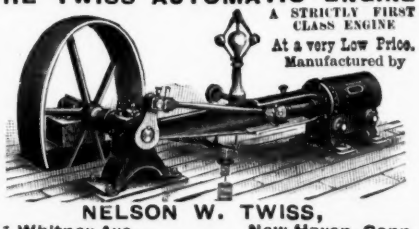

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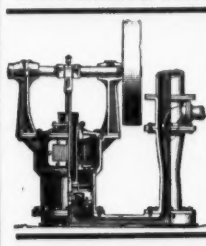

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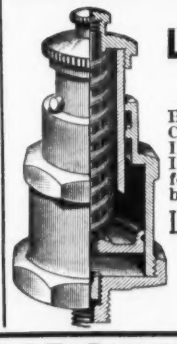

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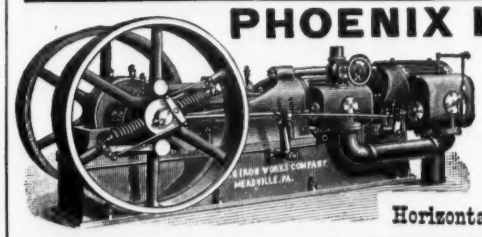

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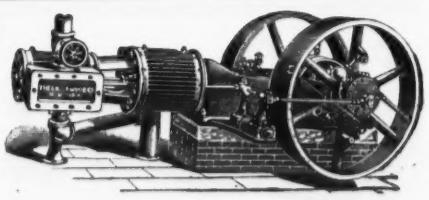

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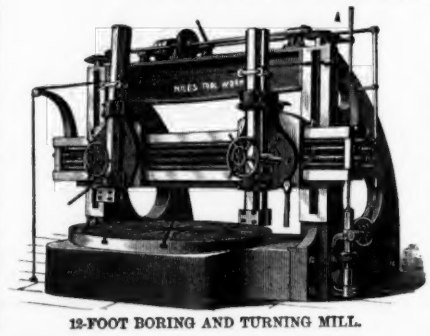

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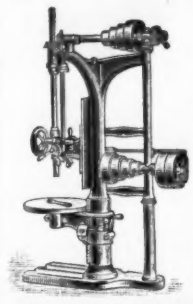

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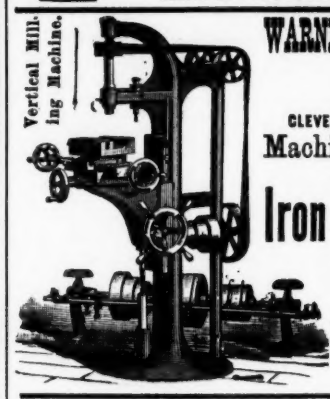

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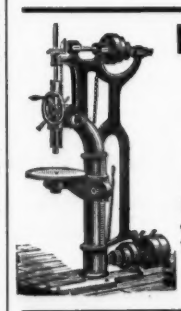

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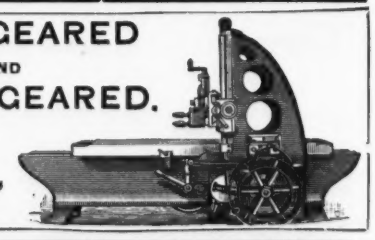

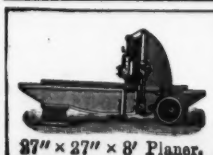

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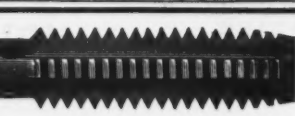

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